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The Journal *of the* Society of Dyers and Colourists

Volume 74



Number 7

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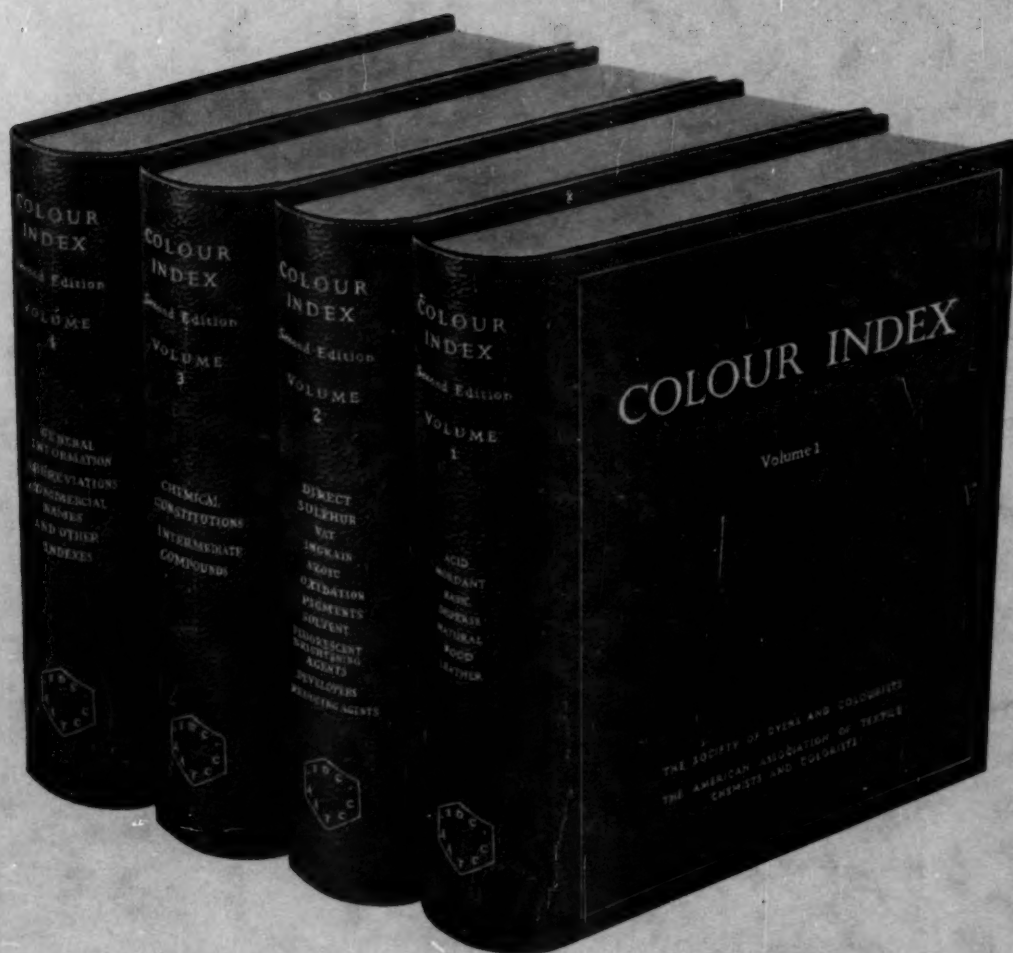
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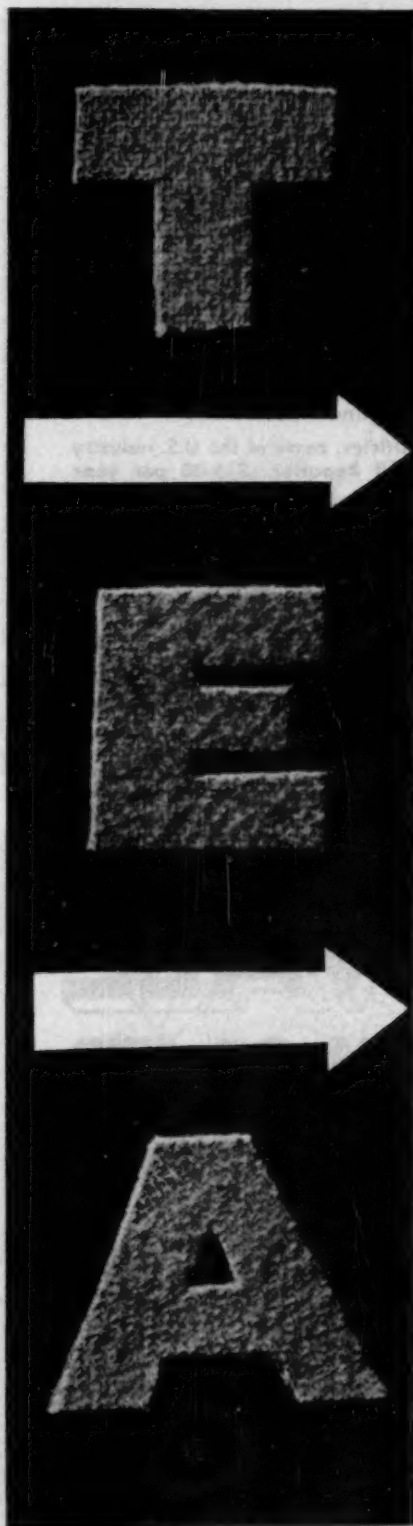
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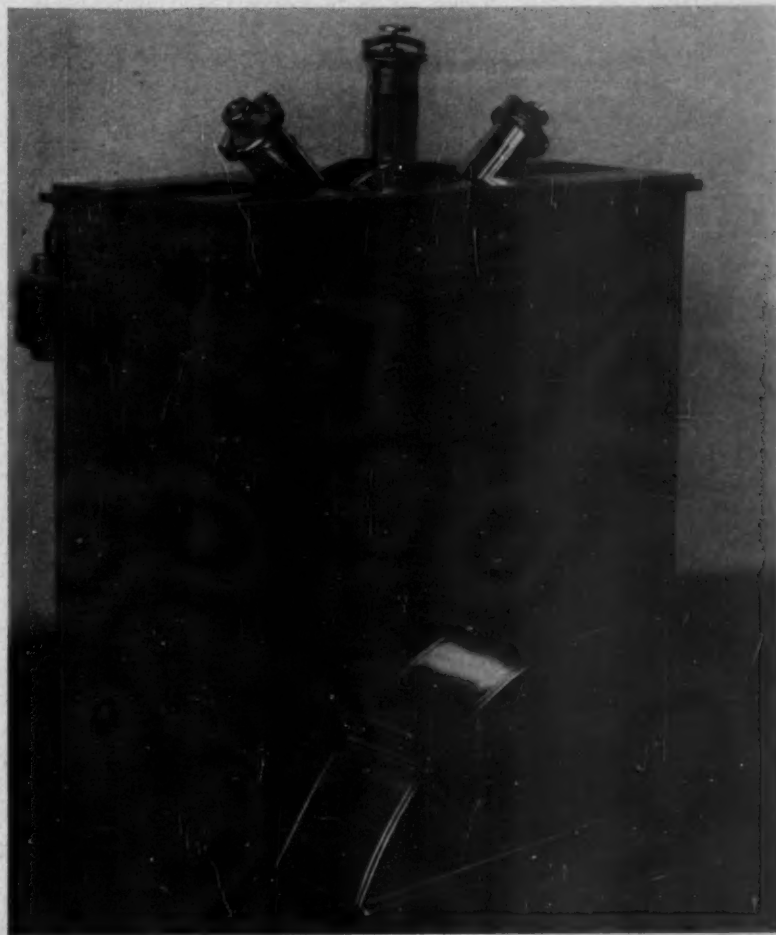
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Readers requiring general information regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1-7 of the January 1958 and pages 509-516 of the July 1958 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (Telephone Bradford 25139). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

The Dyeing of Fast-to-washing Colours on Wool Yarn	J. F. Gaunt
The Dyeing of Acrilan Acrylic Fibre	H. R. Hadfield and M. Sokol
The Latest Trends in the Development of the Field of Azoic Dyes	M. Hüchel

COMMUNICATIONS

The Dyeing of Secondary Cellulose Acetate with Disperse Dyes VII—A Comparison with their Solubility in Organic Solvents	C. L. Bird
Unlevel Dyeing in Wool Velour Cloth	F. J. Parker

EXPLANATORY PAPER ON MODERN THEORY

Surface Activity, Solution, and Adsorption	C. H. Giles
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FORTHCOMING MEETINGS OF THE SOCIETY

Wednesday, 1st October 1958

MIDLANDS SECTION. *Dyeing Unions containing Acrylic Fibres*. B. Kramrisch, Esq., F.R.I.C., F.T.I., F.S.D.C. College of Technology, Leicester. 7 p.m.

Saturday, 11th October 1958

MIDLANDS SECTION. Ladies Evening—Dinner Dance. Grand Hotel, Leicester.

Friday, 17th October 1958

MANCHESTER SECTION. *Some Recent Advances in Textile Printing*. R. J. Hannay, Esq., B.Sc., F.R.I.C., F.T.I., F.S.D.C. (Brotherton & Co. Ltd., Leeds). The Textile Institute, 10 Blackfriars Street, Manchester. 7 p.m.

Wednesday, 29th October 1958

MIDLANDS SECTION. *The Setting, Dyeing and Finishing of Banlon Knitted Goods*. (Lecturer to be announced later.) King's Head Hotel, Loughborough. 7 p.m.

Tuesday, 18th November 1958

MIDLANDS SECTION. *The use of Anti-static Agents in Textile Processing*. A. E. Henshall, Esq., B.Sc. (Joint meeting with the Nottingham Textile Society.) Gas Board Theatre, Nottingham. 7 p.m.

Friday, 21st November 1958

MANCHESTER SECTION. Ladies Evening. College of Science and Technology, Manchester. Further details later.

Wednesday, 10th December 1958

MIDLANDS SECTION. *New Levelling Agents in Acid and Direct Dyeing*. G. H. Lister, Esq., B.Sc., Ph.D. King's Head Hotel, Loughborough. 7 p.m.

Friday, 19th December 1958

MANCHESTER SECTION. *Felisol—An International Guarantee of Colour Fastness*. K. McLaren, Esq., B.Sc., F.R.I.C., F.S.D.C. (Imperial Chemical Industries Ltd.). The Textile Institute, 10 Blackfriars Street, Manchester. 7 p.m.

Friday, 16th January 1959

MANCHESTER SECTION. *The Degradation of Chemically Modified Celluloses by Alkali*. Dr. W. M. Corbett (British Rayon Research Association). The Textile Institute, 10 Blackfriars Street, Manchester. 7 p.m.

Wednesday, 21st January 1959

MIDLANDS SECTION. *The Solubility of Wool Dyes... Assessment and Practical Significance*. W. Beal, Esq., B.Sc. College of Technology, Leicester. 7 p.m.

Friday, 23rd January 1959

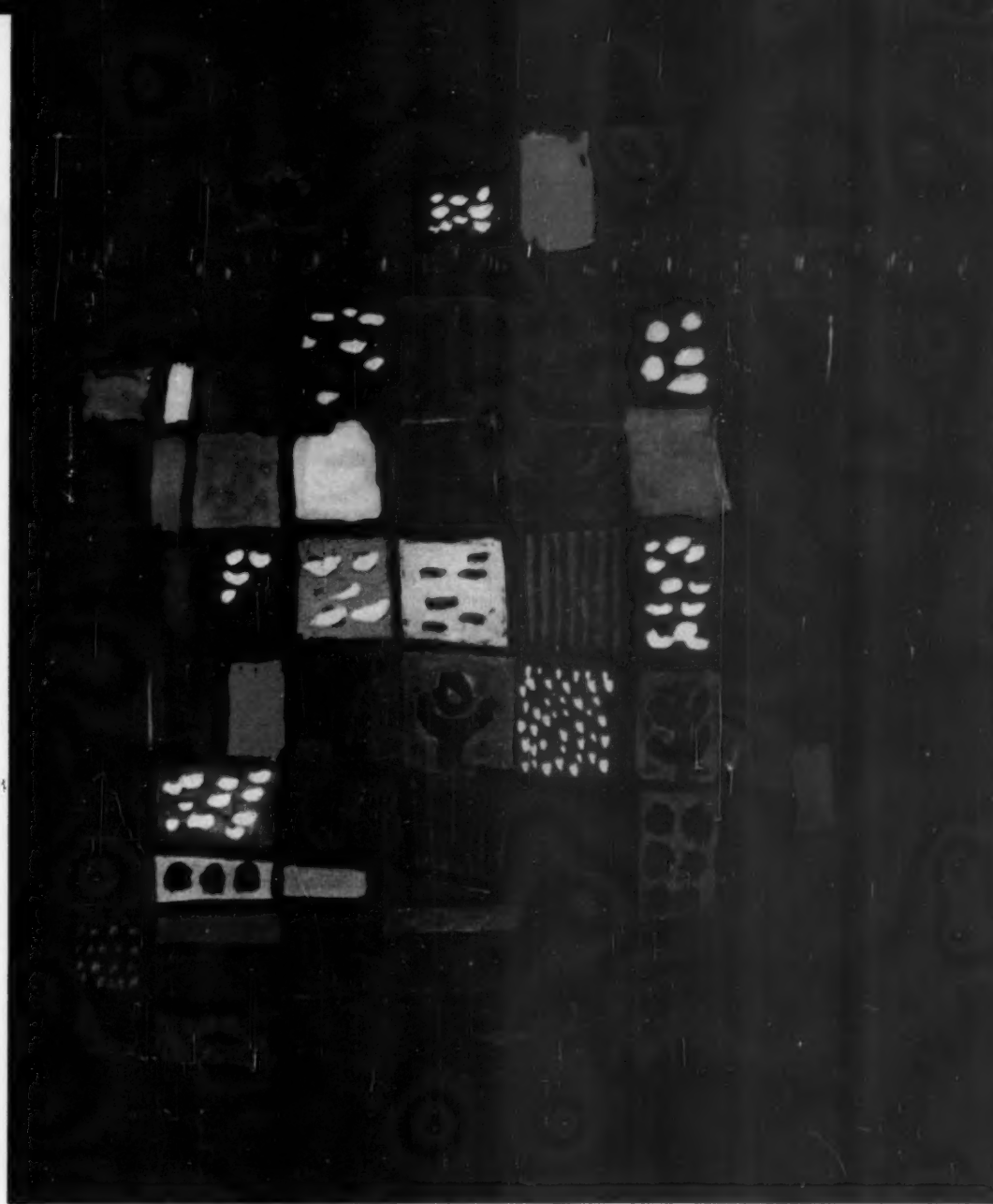
LONDON SECTION. Annual Dinner and Dance. Waldorf Hotel, London, W.C.2. 7 p.m. for 7.30 p.m.

Thursday, 5th February 1959

MIDLANDS SECTION. *Developments in Modern Dry-cleaning Techniques*. E. J. Davies, Esq., M.Sc. Gas Board Theatre, Nottingham. 7 p.m.

Friday, 20th February 1959

MANCHESTER SECTION. *Emulsion Thickenings. Possibilities in Textile Printing*. T. L. Dawson, Esq., B.Sc., Ph.D., A.R.I.C., F.C.S. (Imperial Chemical Industries Ltd.). The Textile Institute, 10 Blackfriars Street, Manchester. 7 p.m.



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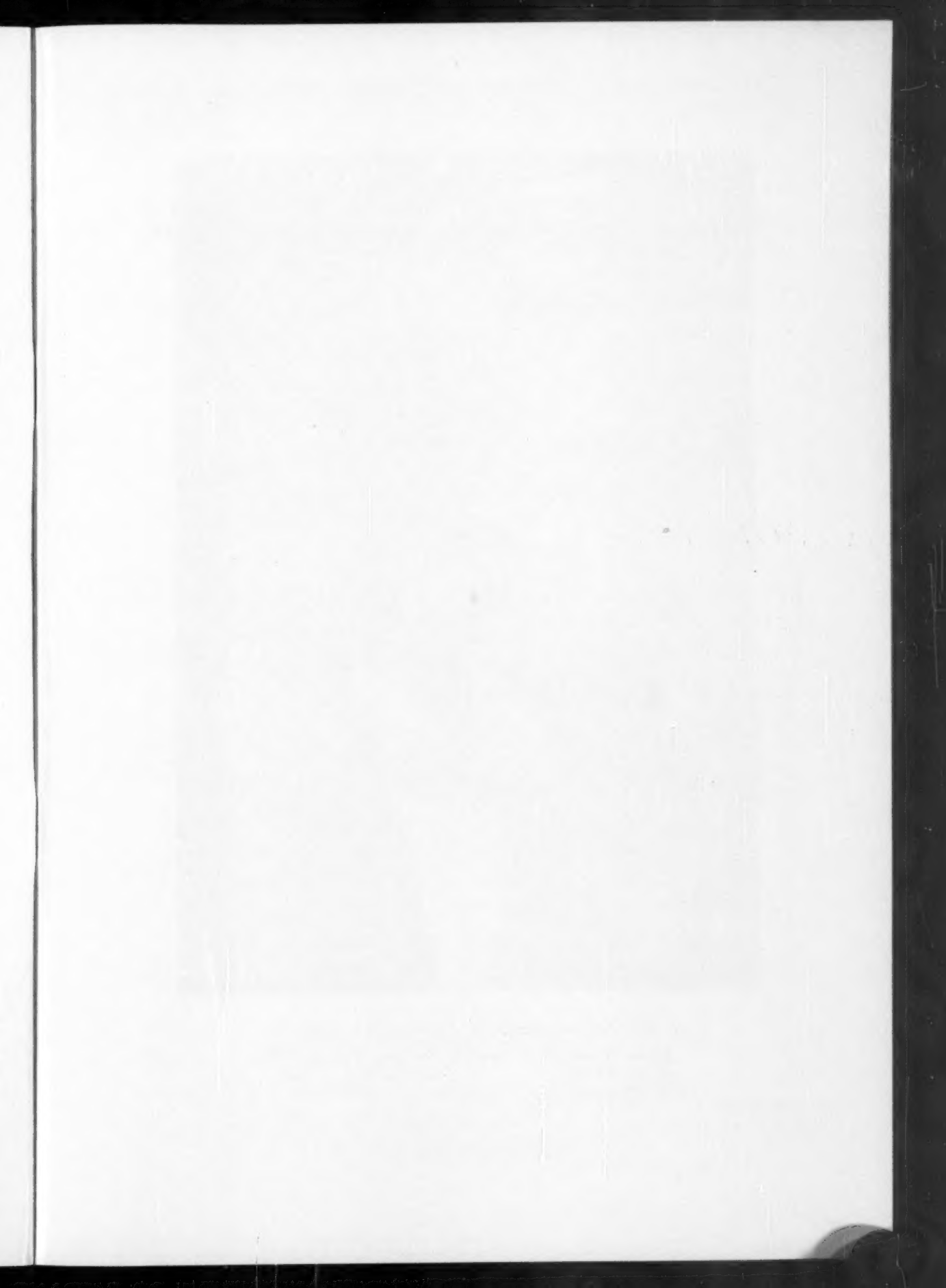


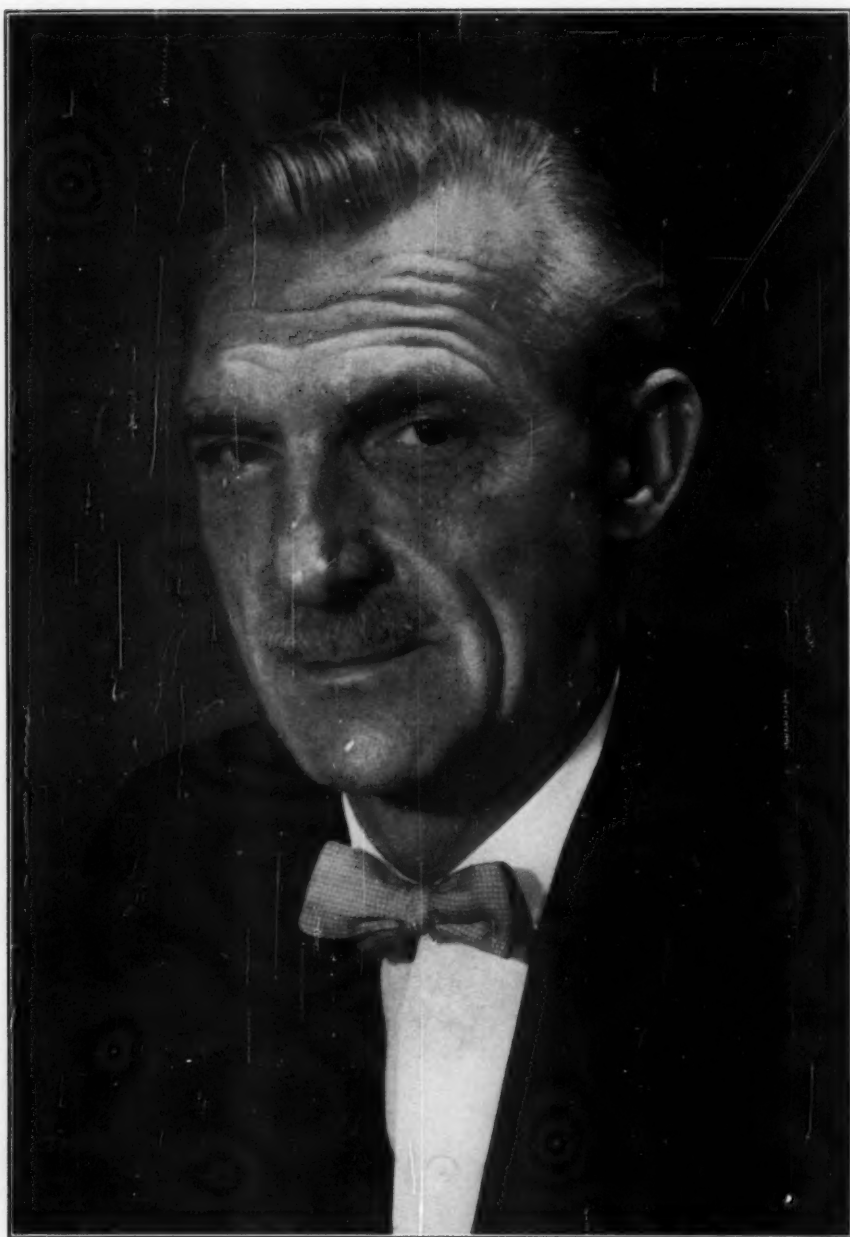
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Volume 74 Number 7

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W. Beal
C. O. Clark
S. R. Cockett
*Kathleen Cope (Mrs.)

F. F. Elsworth
*Joan M. Firth (Mrs.)
R. K. Fourness
J. Furniss

J. M. Goodall
C. W. Green
K. A. Hilton
J. G. Hopkinson

L. Peters
G. E. Styan

(* ex-officio member)

Honorary Secretary ESMÉE SMITH (Miss)
Flat 16, Foxhill, Weetwood Lane, Leeds 16

BRADFORD JUNIOR BRANCH

Chairman R. S. HARDING

Committee

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T. Britton

M. Dunsmore
E. Eastham

W. R. Hermes
P. Smith (Miss)

E. N. Wood

Honorary Secretary KATHLEEN COPE (Mrs.)
232 Wyke Lane, Wyke, Bradford, Yorkshire

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Chairman P. J. SMITH

Vice-chairman C. L. Bird

Committee

J. Budding

J. Fitzmaurice

G. Morton

P. Wainwright

Honorary Secretary JOAN M. FIRTH (Mrs.)
Department of Colour Chemistry and Dyeing, The University, Leeds 2

MANCHESTER JUNIOR BRANCH

Chairman H. A. TURNER

Committee

W. Ingamells

A. P. Lockett

T. A. Nutton

A. Samuels

Honorary Secretary W. R. LEIGH
1 Grange Road, Bromley Cross, Bolton, Lancs.

SCOTTISH JUNIOR BRANCH

Chairman R. A. PHEL

Vice-chairman C. McNeil

Committee

*F. Atack
W. A. Blue

*H. R. Crone
I. Fleming

*W. G. B. Grant
*J. G. B. McCallum

G. McNaughtan

(* ex-officio member)

Honorary Secretary R. McDONALD
5 Orchard Street, Paisley, Scotland

AFFILIATED SOCIETIES

THE SOCIETY OF DYERS AND COLOURISTS OF AUSTRALIA

<i>President</i>	W. H. Wainwright
<i>Immediate Past President</i>	G. Athol Burns
<i>Honorary General Treasurer</i>	W. C. Castle
<i>Honorary General Secretary</i>	J. Brear c/o ICIANZ Ltd. 529 Lonsdale Street Melbourne
<i>Publications Editor</i>	E. I. Noble

SECTION COMMITTEES

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<i>Chairman</i>	W. Waldie
<i>Vice-chairman</i>	R. Brereton
<i>Honorary Secretary</i>	B. Knight
<i>Assistant Honorary Secretary</i>	I. Wood
<i>Honorary Treasurer</i>	B. Firth
<i>Counsellor</i>	T. Hall
<i>Librarian</i>	R. Mayston
<i>Auditor</i>	E. P. Woodall
<i>Committee</i>	F. Brooke, J. Cooper, L. Crawshaw, S. Jenkins, and A. Morrison

GEELONG
(SUBSECTION)

<i>Chairman</i>	A. Gayston
<i>Honorary Secretary</i>	E. Foster
<i>Honorary Treasurer</i>	Miss L. Hill

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<i>Chairman</i>	E. Voitekuns
<i>Vice-chairman</i>	S. G. Pike
<i>Honorary Secretary</i>	S. Pike
<i>Honorary Treasurer</i>	J. Allen
<i>Honorary Librarian</i>	D. Bruce

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<i>Chairman</i>	H. W. Senior
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<i>Honorary Secretary</i>	J. Hardy
<i>Honorary Treasurer</i>	F. Powell

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<i>Chairman</i>	P. Hogg
<i>Vice-chairman</i>	M. G. Tune
<i>Honorary Secretary</i>	I. G. Curtis
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<i>Honorary Secretary</i>	F. T. Schafer
<i>Assistant Honorary Secretary</i>	G. Charles
<i>Honorary Treasurer</i>	A. Miller

DYERS AND COLOURISTS ASSOCIATION OF SOUTH AFRICA

P.O. Box 1700, Durban

<i>Chairman</i>	J. H. Allen
<i>Vice-chairman</i>	E. Hipperson
<i>Committee</i>	E. Cornah B. Farmer
<i>Treasurer</i>	E. Cullis
<i>Secretary</i>	G. H. Hayward

Proceedings of the Society

Annual General Meeting

The Seventy-fourth Annual General Meeting of the Society of Dyers and Colourists was held at the Central Hotel, Glasgow, on Friday, 25th April 1958, at 3.45 p.m., the President (Mr. CLIFFORD PAINE) being in the chair, and about sixty members of the Society being present.

The President welcomed members to the Seventy-fourth Annual General Meeting of the Society and extended felicitations to the Scottish Section on their Golden Jubilee. He referred to this being his last formal appearance as President of the Society and mentioned how enjoyable had been the privilege of dining with the Worshipful Company of Dyers on the occasion of their presentation of the Research Medal to one of the Society's members. On this occasion the recipient, Mr. K. McLaren, had done the Society very great credit by his gracious speech on receiving the award.

1. NOTICE CONVENING THE MEETING

At the President's request the General Secretary read the Notice convening the Meeting.

2. MINUTES OF THE 73RD ANNUAL GENERAL MEETING HELD ON 29TH MARCH 1957

The President said that as an innovation the Minutes of the 73rd Annual General Meeting had been printed and included under the cover of the Annual Report. There had been received no written corrections and he therefore assumed these Minutes were in order and acceptable to be taken as read.

Mr. R. A. PEEL formally proposed, Dr. H. A. THOMAS seconded, and it was—

Resolved that the Minutes of the Annual General Meeting of Members held on 29th March 1957, at Grosvenor House, London, be adopted.

Dr. H. A. THOMAS expressed the hope that in future those attending would be so numerous that individual publishing of names would be impracticable.

3. ANNUAL REPORT OF THE COUNCIL OF THE SOCIETY

The Society continues to co-operate with educational authorities and with industry with a view to improving technological training in the field with which the Society is primarily concerned. The Society's Associateship Examination should make a growing contribution to this objective. During the year nineteen candidates satisfied the Examinations Board and on the recommendation of the Diplomas Committee Council was pleased to grant Associateship in all cases. The Diplomas Committee, with the assistance of the Examinations Board, has devoted considerable effort to co-ordinating courses at the various technical institutions intended as preparation for the Society's Associateship examinations. There is considerable evidence that the special textbooks published

under the Society's sponsorship are welcomed as valuable contributions to educational work.

The Society has 4,500 members and subscribers, which is the highest figure recorded in the Society's history, and likewise the monthly circulation of the *Journal* has been more than maintained. The Sections of the Society continue their active work in various parts of the country. It is with pleasure that Council reports the formation at the beginning of the year of a new Junior Branch in the Scottish area.

The monumental task of preparing and producing the Second Edition of the *Colour Index* is now nearing its close. The first three volumes have been published and issued to subscribers in forty countries. Council has decided to present specially bound and inscribed copies of the new *Colour Index* to the present members of the *Colour Index* Panel as a token of the Society's thanks for their splendid work.

As indicated in the previous report, the Society is to be the host for the Fifth Congress of the International Federation of Associations of Textile Chemists and Colourists to be held in London on 16th–18th September 1959. We are expecting to make this an occasion of outstanding quality. Small committees are already working on the details of the scientific, technical and social programmes and the problems of financial budgets. Preliminary announcements have been made in the *Journal* and more detailed information will be published as it becomes available.

Council awards the Gold Medal of the Society to John Barritt for exceptional services to the Society during his work as Chairman of the *Colour Index* Panel.

Council awards the Silver Medal of the Society to Fred Atack for his services to the Society as Honorary Secretary of the Scottish Section from 1947 to 1957.

The Society held the Annual Dinner at Grosvenor House, London, on 29th March 1957, and this was a great success. The principal guest was The Rt. Hon. Lord Milner of Leeds.

The Society held a Symposium on 18th–20th September 1957 at Buxton under the title *Recent Advances in the Colouring of Man-made Fibres*. More than 400 people registered for the Symposium and attendances at the technical sessions were consistently high and the discussions lively. The Symposium was the most internationally representative of any yet held by the Society with delegates and authors from U.S.A., Japan, and many European countries including the U.S.S.R. The evening social events, which included hospitality from the Mayor and Corporation of Buxton, were greatly enjoyed. The principal guest at the Dinner on Friday, September 20th, was Mr. Donald Kaberry, M.P. The Council congratulates

all concerned with the organisation of the Symposium.

The Fourth George Douglas Lecture was given at the Midland Hotel, Manchester, on 7th February 1957, by Mr. George S. J. White, on *Dyeing*.

The Fourteenth John Mercer Lecture on *The Influence of Fibre Types on Dyeing Methods* was given by Mr. J. S. Ward at the Grand Hotel, Leicester, on Friday, 3rd May 1957. The President was in the Chair on both occasions.

The Society continues its cordial relationship with the Dyers and Colourists Association of South Africa and the Society of Dyers and Colourists of Australia. Likewise, the Society's co-operation with the American Association of Textile Chemists and Colorists in the work of the *Colour Index* continues. The Society's membership of the International Federation will further widen its contacts with other societies overseas. Council expects to give special consideration during the coming year to the improvement of methods of dealing with international aspects of the Society's affairs.

The Chairmen, Honorary Secretaries and Committees of the various Sections and Junior Branches of the Society continue to devote a great deal of time and energy to the service of the Society, and Council is greatly appreciative of their good work.

The Council is glad to have the opportunity of expressing its thanks to the firms, colleges, technical institutions, and other organisations which help the work of the Society in so many diverse and practical ways.

The Annual Golf Competition for the Goodall Trophy was held on the course of the Cavendish Golf Club, Buxton, on Saturday, 21st September 1957, under distinctly inclement conditions. The winner on this occasion was Mr. L. S. Newton, of Cheadle Hulme, Cheshire. The Council thanks Mr. W. R. Leigh for organising the competition once again. Miniature cups have been presented to all the winning competitors since the inauguration of the competition.

Reports on Activities of Committees

SOCIETY'S MEDALS COMMITTEE—The Committee's recommendations, which were accepted by Council, are reported above.

WORSHIPFUL COMPANY OF DYERS RESEARCH MEDAL COMMITTEE—Council has recommended, in accordance with the decision of the Adjudicating Committee, that the Research Medal be awarded to Keith McLaren, B.Sc., F.R.I.C., F.S.D.C., for a series of papers on Light Fastness Testing and Fading of Dyes. The Court of the Worshipful Company has considered and approved the recommendation for this award.

DIPLOMAS COMMITTEE—During the year this Committee recommended to Council the election of seven Fellows and nineteen Associates. The Diplomas Committee expresses its thanks to the Examinations Board, the examiners, and college staffs who planned and conducted the 1957 Associateship examination so effectively.

PUBLICATIONS COMMITTEE—During the year the Committee has devoted time to obtaining the maximum number of lecture manuscripts for

publication in the *Journal*. The *Journal* cover design has been modified to include the Society's Coat of Arms. The Buxton Symposium papers will appear in several issues of the *Journal* early in 1958. These papers will also be available in the form of a separate bound volume.

The Textbooks and Monographs Subcommittee has been responsible for the publication of the book entitled *A Laboratory Course in Dyeing* by Dr. C. H. Giles, and a monograph by Dr. A. Datyner on *The Dyeing of Half Hose* will appear shortly. The Subcommittee hope that other Sections will follow the lead of the Midlands Section in sponsoring monographs dealing with practical dyeing.

PRESERVATION OF HISTORICAL RECORDS—During the year some additions have been received and a catalogue of the Society's collection is being prepared.

COLOUR INDEX EDITORIAL PANEL—Detailed work on Volume IV is almost completed and this volume should be published about the middle of 1958. The Panel will recommend a scheme for keeping the *Index* up to date.

The Society greatly appreciates the generosity with which firms and Associations have continued to allow members of their staffs to participate in the work of the Panel. Without the availability over a long period of this fund of knowledge and experience our task would have been impossible. Co-operation with our partners, the American Association of Textile Chemists and Colorists, has been active throughout the year, and their contribution to Volume III has been especially valuable.

FASTNESS TESTS CO-ORDINATING COMMITTEE—Following the meeting of the I.S.O. Subcommittee on Colour Fastness in New York in September 1956, the Committee has prepared a supplement to the Third Report and its equivalent, the brochure *Standard Methods for the Assessment of the Colour Fastness of Textiles*, embodying all the amendments agreed upon internationally. These amendments are to be published in the January 1958 issue of the *Journal*.

The Chairman and Honorary Secretary have been made *ex-officio* members of all subcommittees in order to achieve a further measure of co-ordination.

The subcommittees have continued their detailed examination of existing and new tests, and some of their activities are given below—

Light Fastness Subcommittee—Work is in progress on the testing of light fastness at high humidities, and a draft is in preparation for prescribing the conditions under which such a test should operate. Testing of light fastness on weathering is also under examination.

Gas Fume Fading Subcommittee—The membership has been increased to 8, which, with the two *ex-officio* members, brings the total to 10. The method of testing as given in the Third Report of the F.T.C.C. is under review, in view of a number of criticisms which have been received. In correspondence with overseas fastness tests committees it has been noted that Germany and Canada, though not the U.S.A., prefer a test on the lines

of the one given in the Second Report, and consequently this test is being re-examined. The subcommittee held three meetings during the year.

Pleating Fastness Subcommittee—Attention has been given mainly to a Steam Pleating Test and this has now reached an advanced stage. It is expected that a draft of a provisional test will be forwarded shortly to the F.T.C.C. An examination is being made of the apparatus which would be suitable for a test for fastness to dry heat pleating. The subcommittee, which was set up towards the end of 1955, has held three meetings since its formation.

Alkaline Milling Subcommittee—The Subcommittee, which met on two occasions during the year, has reviewed the changes in the method of the test agreed upon tentatively at New York and has accepted these changes. Consideration has been given to a suggestion from the European Continental countries that there should also be a mild milling test, but the subcommittee feels that this is not required.

Perspiration Subcommittee—Further examination has been made of the effects of perspiration on the light fastness of direct dyes which do not contain copper and it has been shown that destruction of the dye itself may take place. It has previously been shown that perspiration can remove copper from copper-complex dyeings. All the work of the subcommittee confirms the need for the presence of histidine or a similar compound in artificial testing solutions.

TERMS AND DEFINITIONS COMMITTEE—The Committee completed its review of tentative definitions. Several more terms have been defined and a list of some 130 definitions will be published early in 1958.

REVIEW OF TEXTILE PROGRESS—The usefulness of this annual conspectus of research and development in the textile industries, the joint responsibility of the Society and the Textile Institute, is shown by the continuing steady demand even for the earlier volumes. Publication of Volume 8 indicates that the *Review* is approaching its first decade of life in full vigour with contributions from overseas as well as British experts.

THE SOCIETY AND THE TEXTILE INSTITUTE JOINT MOTHPROOFING COMMITTEE—The main work in which this Committee is interested is now being done by the International Wool Textile Organisation but the Committee remains in being to deal, on behalf of the parent Societies, with matters which arise.

Representation on External Bodies

B.S.I. RAYON INDUSTRY COMMITTEE—During the past year there has been only one meeting of the Committee held in London on March 26th. Many of the items discussed were not of direct interest to members of the Society but two were of possible interest. The first was a discussion of "Standards for Furnishing Fabrics", which included standards of light and wash fastness—at the time of the meeting no agreement was arrived at—and the second concerned "Flammability of Clothing Textiles", where reference was made to

the work of a technical committee mentioned below.

B.S.I. TEXTILE DIVISIONAL COUNCIL—During 1957 there was one meeting and the Society's representative, Dr. H. A. Thomas, was nominated and later elected to the B.S.I. General Council. The progress of the Committee set up to deal with flammability of textiles was followed with considerable interest. Mr. Tankard, the Chairman of the Physical Testing Committee of the Textile Institute, reported that work on the method of testing flammability was well advanced and a draft procedure had been prepared.

A report on the third meeting of the International Standards Organisation on textiles was presented by Mr. Bayes, who stated that agreement had been achieved on a universal system of designating yarn count; namely, the "TEX" direct numbering system of grams per kilometre.

The setting up of tests for assessing the chemical degradation of cellulose fibres is still under consideration.

The agenda for the Textile Divisional Council meeting contained no items relating to the measurement of colour fastness.

B.S.I. STEERING COMMITTEE T/-8—The Committee held four meetings during the year. A proposal that work should be initiated on the measurement of whiteness and brightness of fluorescent textiles was referred to the Society for consideration.

CHEMICAL SOCIETY LIBRARY COMMITTEE—The Committee met five times during this year and has reviewed the newly published works on chemistry and allied subjects. Over 100 new works and journals have been added to the Library during the year; these additions will be of considerable interest and use to members of the Society.

The physical reorganisation of the Library, which has been completed, has proved most successful.

CITY AND GUILDS OF LONDON INSTITUTE DYEING ADVISORY COMMITTEE—The Committee held one meeting during the year. The business of main interest to the Society was the acceptance by the Committee of the reprints of the explanatory papers which had been submitted officially by the Society. It was agreed that these publications be added to the official list of textbooks and works of reference for subject 45, which is The Dyeing of Textiles, with a note that copies can be obtained through the Society. It was also agreed that any further publications of the Society in the same series should be added to the list as they appear. It was also agreed that publications which were reproduced from the *Journal* of the Society should give reference to the relevant volumes of the *Journal*. The Society was asked to consider the adoption of a uniform style of publication for its educational series as a whole to facilitate its collection into a single volume.

The Committee was pleased to add to its list of recommended books the new *Colour Index* and the new report of the work of the Fastness Tests Coordinating Committee.

Dr. R. L. Elliott, the Society's representative, undertook to carry out a review and amendment of the list of books for the City and Guilds.

The Society was recommended to organise, preferably in the Midlands, a Summer School concerned with the dyeing of the newer synthetic fibres and with a special appeal to teachers.

Consideration will be given at future meetings to the desirability of introducing practical examinations in subject 45 (The Dyeing of Textiles).

PARLIAMENTARY AND SCIENTIFIC COMMITTEE—During the year Council decided to appoint two member representatives to this Committee. Contacts and information obtained through this medium will be helpful to the Society in formulating its future policy.

REGIONAL ADVISORY COUNCIL FOR TECHNICAL AND OTHER FORMS OF FURTHER EDUCATION FOR MANCHESTER AND DISTRICT—The Society continued to be represented.

THE ROYAL SOCIETY—BRITISH NATIONAL COMMITTEE FOR CHEMISTRY—The Committee met twice during 1957. At the February meeting the report of the subcommittee set up to consider the papers to be presented at the Conference of the International Union of Pure and Applied Chemistry to be held in Paris in July 1957 was discussed. The report of the British Delegation to the Conference was received in October. Notice was taken of other International meetings on Chemistry held during 1957. No items of immediate interest to our own Society were discussed.

SOCIETY OF LEATHER TRADES CHEMISTS—COMMITTEE FOR FASTNESS PROPERTIES OF DYES ON LEATHER—The Committee continued to accept and modify where necessary the Society's fastness tests so that they could be used for leather.

TEXTILE INSTITUTE—TECHNICAL COMMITTEE "D"—The Committee has met eight times during 1957. The main work of the Committee has been concerned with the analysis of fibre blends and as a result two tentative Textile Standards have been issued. These are for the quantitative determination of blends of viscose rayon with cotton, and blends of polyamide fibres with cotton, or viscose rayon, or wool, or polyester fibres. A method for determining these fibres in ternary mixtures is nearly complete.

Other work in progress includes the quantitative determination of urea-formaldehyde finishes on textiles and methods for determining the composition of blends containing cellulose triacetate. Methods are being revised for determining water-soluble impurities, the conductivity, and pH of aqueous extracts from textiles.

The Society's representatives report that there has been no business of special interest to the Society in the work of the following Committees during the year.

British Biological Stains Commission

British Standards Institution—

Colour Terminology

Cotton Industry Committee

Linen Industry Committee

Electric Discharge Lamps

Proofed Clothing—Dyeing and Finishing Processes Committee

Rotproofing of Textiles other than Clothing Subcommittee and Panel on Standards for Anodic Oxidation Finishes for Aluminium and Aluminium Alloys

Wash Fastness of Buttons

Wool Industry Standards Committee

Royal Technical College, Salford—Applied Sciences Advisory Committee

Textile Institute—Unification of Testing Methods Committee.

The Honorary Secretary, Mr. L. MORTON WOOD, said it gave him great pleasure once again to propose the adoption of the Annual Report, and he would like to touch on one or two aspects of the work of the Society. He pointed out that the Annual Report was largely made up from the various Committee Chairmen's reports to Council and they were modest men. Their reports seldom reflected the vast amount of work that had been undertaken on behalf of the Society voluntarily. He therefore wanted everybody who had undertaken work on behalf of the Society, and made it such a successful year, to know how grateful Council was for these services, which had so willingly been given. Continuing, Mr. Morton Wood paid tribute to the Society's growth in status and dignity and reported that the membership including *Journal* subscribers was the largest the Society had ever had. He urged that the members must not be complacent, as our membership should be higher and we must seek to widen the fields of activity, increase our status, and be recognised for what we are as the premier Society of its type throughout the world.

It was twelve years since work had commenced on the production of the *Colour Index*, which had been a tremendous task with a vast amount of work put in by the *Colour Index* Editorial Panel, who were to be congratulated on producing this monumental book of reference. A supplement would, in due course, be produced.

The Society would be host to The International Federation of Associations of Textile Chemists and Colourists, on 16th, 17th, and 18th September 1959, when their Congress would take place in London for the first time. Arrangements were well in hand, and, urged Mr. Wood, "we must all make every effort to ensure that this is a great success". This will virtually be the Society's Symposium for 1959.

In August 1958 the Society would be holding a Summer School at Nottingham, and those participating should derive tremendous benefit. Whilst on the subject of education, Mr. Wood felt it was gratifying to note that the Society's examinations were becoming more widely recognised, and in his opinion the time would come when every technical dyer would be expected to hold the Society's diplomas. Mr. Wood added—

"I would like personally to congratulate our President on the way he has conducted our meetings during his term of office. I often wonder if he would have accepted the Presidency had he

Balance Sheet as at 31 December 1957

31.12.56	SURPLUS AND LIABILITIES				31.12.56	ASSETS			
							Approx. Middle Market Value 31.12.58		At Cost
		£	s.	d.			£	s.	d.
	Accumulated Fund					Accumulated Funds			
38,183	Balance 1st January 1957	38,084	11	3	22,042	Investments	17,210	13	8
592 38,685	Add — Surplus for the year	883	16	3					21,945 1 0
						Foundation Fund			
1,851	Foundation Fund	1,850	13	0	1,851	Investments	1,850	13	0
100	Knecht Memorial Fund	100	0	0	100	Knecht Memorial Fund			
						Investments	68	11	2
2,000	George Douglas				2,000	George Douglas Lecture			
	Lecture Fund	2,000	0	0		Fund Investments	1,207	13	5
									2,000 0 0
323 4,374	George Douglas				25,993		220,326	10	3
	Accumulated Income	276	9	6					25,895 14 0
	Sundry Creditors and Provision for Miscellaneous Expenditure								
3,013	Society	2,144	13	1	78	Cash in Hand	146	4	0
634 3,648	New Colour Index	7,202	5	7	1,444	Cash at Bank	2,467	8	0
					4,111	Debtors	3,123	12	3
					2,531 3,164	Stocks	3,685	3	2
									9,438 7 6

Consolidated General Revenue Account

for the Year ending 31 December 1957

31.12.56	EXPENDITURE	£ s. d.	31.12.56	INCOME	£ s. d.
8,766	Salaries, Wages, National Insurance and Honoraria	9,184 5 4	7,660	Membership Subscriptions	7,961 4 7
486	Rent, Rates and Insurance	904 13 1		Journal	
131	Electricity and Heating	148 8 11		Sale of Journals, Reprints, Combined Reports, Advertising etc., as adjusted for Opening and Closing Stock	16,852 16 1
386	Telephone	390 19 2	15,384	Investment Income (Gross)	683 0 0
1,064	Printing and Stationery	1,326 2 10	683	Interest on Bank Deposit Account	7 10 9
469	Postages	473 19 4	125	Balance of Account "Fastness Tests"	432 10 4
206	Hire of Rooms for Council, Committees, Conferences, etc.	131 17 0	675	Donations	160 10 0
255	Travelling and Hotel Charges	503 16 10	11	Bad Debts Reserve Written Back and Amounts Recovered	— — —
34	National Deferment Expenses	19 4	256	Buxton Symposium	349 10 4
236	Incidental Office Costs	176 11 7		(Subject to further liabilities for printing and publishing)	
116	Depreciation of Office Furniture and Equipment	150 0 0	14,329	Transfer of Expenditure relating to Colour Index	27,321 9 10
63	Bank Charges	83 8 3			
190	Audit	180 0 0			
136	Repairs and Renewals	216 18 4			
164	Medals, Prizes and Illuminated Addresses	39 4 3			
16	Donations and Subscriptions	47 17 6			
71	Diploma Costs (Less Fees)	90 11 6			
1,354	Sectional Costs	1,258 6 10			
13,033	Printing and Publishing Journal and other Publications	13,245 6 3			
74	Publication Committee Expenses	78 18 3			
289	Abstractors' Fees and Book Reviews	345 12 7			
9,662	Printing and Publishing Colour Index	20,307 6 5			
304	Colour Index — Administration, Advertising Shipment and Dispatch	2,836 9 0			
188	Expenses incurred for Colour Index but not allowable per Agreement with A.A.T.C.C.	153 14 9			
161	Annual Meeting and Dinner	350 19 4			
17	Buxton Symposium	— — —			
121	International Federation	128 8 9			
502	Net Surplus for the Twelve Months	883 16 3			
<u>£39,122</u>		<u>£53,768 12 8</u>	<u>£39,122</u>		<u>£53,768 12 8</u>

COLOUR INDEX

COLOUR INDEX (SECOND EDITION) ACCUMULATIONS ACCOUNT

	£ s. d.		£ s. d.
17,176	Accumulated Total of Expenditure to 1.1.57	34,136	Accumulated Total of Expenditure to 31.12.57
28,960	Expenditure during the year including provision for printing of final volume		61,457 11 9
<u>£34,136</u>	<u>£61,457 11 9</u>	<u>£34,136</u>	<u>£61,457 11 9</u>

GEORGE DOUGLAS ACCUMULATION FUND ACCOUNT

	£ s. d.		£ s. d.
Lecture Expenses	104 15 6	Balance per Accumulated Income Account	323 14 10
Bank Charges	2 0 0	1.1.57	
Balance per Accumulated Income Account	276 9 6	Investment Income (Gross)	39 10 2
324 31.12.57	£383 5 0	3% British Transport Stock 1979/89	
£326		£326	£383 5 0

GEORGE DOUGLAS LECTURE FUND

	Balance 1956	Alterations	Balance 1957	Middle Market Value 1956	Middle Market Value 1957	Middle Market Quotation
British Transport Stock	£2,000 0 0		£2,000 0 0	£1,354 3 0	£1,207 13 8	

KNECHT MEMORIAL FUND

Southern Rhodesia	£100 0 0	£100 0 0	£71 13 0	£68 11 2	69½
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SCHEDULE OF FOUNDATION FUND ACCOUNT INVESTMENTS

	£ s. d.		£ s. d.	£ s. d.	£ s. d.
2½% Defence Bonds	1,245 0 0	Redeemed 2nd October 1957	500 0 0	1,245 0 0	500 0 0
National Savings Certificates 10s. Units 8th Issue	500 0 0		500 0 0	500 0 0	500 0 0
3% Savings Bonds	69 9 0		69 9 0	63 7 0	51 11 6
Treasury 3½% Stock 1960/82	36 4 0		36 4 0	39 1 0	28 14 9
3% British Electricity Guaranteed Stock 1968/73	- - -	Purchased 13th November 1957	1,245 0 0	- - -	1,282 6 2
£1,850 13 0		£1,850 13 0		£1,827 8 0	£1,830 12 5

SCHEDULE OF DEVELOPMENT ACCOUNT INVESTMENTS

£2,763 2s. 8d. 3% British Transport Guaranteed Stock 1978/88	2,593 17 0		2,593 17 0	1,886 17 0	1,892 1 0	60½
£750 2½% Funding Stock 1956/61	750 0 0		750 0 0	672 14 0	379 13 9	90½
£546 3½% Conversion Loan	557 0 0		557 0 0	385 6 0	344 6 4	63½
£255 2½% Defence Bonds	255 0 0	Redeemed 4th February 1957	- - -	958 0 0	- - -	- - -
£2,740 16s. 0d. 3% Savings Bonds 1960/70	2,750 0 0		2,750 0 0	2,144 17 0	2,072 13 3	75½
£750 3% Funding Stock 1966/68	750 0 0		750 0 0	600 18 0	589 18 9	78½XD
500 National Savings Certificates 10s. Units 7th Issue	375 0 0		375 0 0	375 0 0	375 0 0	- - -
£2,000 3% British Gas Stock 1960/86	2,000 0 0		2,000 0 0	1,367 10 0	1,307 10 0	60½
£2,017 11s. 6d. 3% Treasury Stock 1966 or after	1,957 1 0		1,957 1 0	1,250 16 0	1,099 11 0	54½
£901 3s. 6d. 3% Southern Rhodesian 1971/73	910 13 9		910 13 9	725 0 0	625 3 10	69½
York County Savings Bank	4,319 5 5	Interest credited during the year £121 1s. 10d.	4,448 1 3	4,319 5 5	4,448 1 3	- - -
£1,500 12s. 9d. 3% British Electricity Guaranteed Stock 1968/73	1,495 19 0	Defence Bonds Interest credited during the year £7 14s. 0d.	1,405 19 0	1,127 7 0	1,080 9 2	72
Post Office Savings Bank	1,102 6 4	Interest credited during the year £29 4s. 4d.	1,131 10 8	1,102 6 4	1,131 10 8	- - -
£1,000 Chesterfield Corporation 3% Stock 1960	993 15 0		993 15 0	899 0 0	923 2 8	92½
£1,037 17s. 3d. Treasury 3½% Stock 1979/81	1,007 3 4		1,007 3 4	893 1 0	740 15 6	71½
£220 3½% Defence Bonds	220 0 0		220 0 0	220 0 0	220 0 0	- - -
£22,643 0 10		£21,945 1 0		£18,163 19 9	£17,819 13 3	

known the tremendous amount of work in store for him. He has always made time to deal with the affairs of the Society, and those of us who have worked closely with him have appreciated his judgment and tact, and I sincerely hope and trust the Society will continue to have the benefit of his helpful interest and guidance in years to come."

Mr. Wood, concluding, said—"I would like to take this opportunity of thanking our officials, Mr. J. W. Nicholls and Dr. C. J. W. Hooper, for the conscientious way they have handled our affairs throughout the year and to the staff for the way in which they have backed them up." He expressed great pleasure in proposing the adoption of the Annual Report.

The Vice-chairman of Council, Mr. G. S. J. WHITE, seconded the adoption of the Report and said that now he was retiring from Council he would like to inform non-Council members of the very conscientious way the Council business was conducted. The attendance of Council members was quite astounding in view of their other responsibilities.

The motion was carried unanimously.

4. PRESENTATION OF BALANCE SHEET, STATEMENT OF ACCOUNTS, AND AUDITORS' REPORT FOR THE YEAR ENDED 31ST DECEMBER 1957

In moving the adoption of the Balance Sheet and Statement of Accounts, the Honorary Treasurer, Mr. A. WADDINGTON, said the Accumulated Funds of the Society now exceeded £40,000, which was a happy position for the Society, particularly as its first object was not the making of profits.

Mr. Waddington pointed out that, as he had remarked at the last Annual General Meeting, the Society was still very much concerned with rising costs, although so far these had been covered by increased revenue.

Mr. Waddington thought it was going to be more difficult in the future to continue to balance the Society's expenditure against income. He said: "We shall try as far as ever possible to continue to increase the income to meet the cost of printing and everything else which is constantly rising." He assured the members that there would be no increase in the subscriptions until this was absolutely necessary, but having in mind that the efficiency of the Society must be maintained, we might be compelled by circumstances to review the income from subscriptions.

The *Colour Index* was now in its final stages of publication, and there are very few heavy expenses to be met; it was gratifying that, with the help from America, it had not been necessary to realise any investments to pay for the *Colour Index*.

The Honorary Treasurer formally moved the adoption of the Accounts and Balance Sheet.

The President, replying to a question regarding the increase recorded for the Annual Meeting and Dinner, and for Hotels and Travelling, pointed out that the last Annual Meeting and Dinner was held in London, and it was a well known fact that the cost of doing anything in the capital city was greater than in the provinces. Referring to the increase in travelling and hotel charges, Mr. Paine explained that the Society in expanding its scope

and its status must inevitably increase costs when promoting proper liaison.

Mr. J. W. REIDY, Chairman of the Finance and General Purposes Committee, supported the President's remarks and formally seconded the adoption of the Annual Accounts for the year 1957. He paid tribute to the enormous amount of work done by Mr. Waddington, the Honorary Treasurer, and in re-organising our methods of payment and our general system Mr. Reidy considered that the conduct of the affairs of the Society was now in keeping with the best practice.

The adoption of the Accounts and Balance Sheet as at 31st December 1957 was unanimous.

5. ELECTION OF PRESIDENT FOR THE FORTHCOMING YEAR

Mr. FRED SMITH said he felt it was a great honour to propose the election of Mr. John Boulton as President of the Society for the ensuing year. He knew of many men in the Society who were fitted to take this high office, but he knew of none more so than Mr. John Boulton, who had always taken a keen interest in the Society. Much benefit had been derived from his services not only as Chairman of the Manchester Section and a member of many Committees, but also in the field of research. Mr. Smith felt that the Society could not be served by a better man. He had been recommended by every Section of the Society, and he was widely known by Sections and internationally. Mr. Smith also felt honoured that he was sharing this proposal with his old friend, Dr. Whittaker.

Dr. C. M. WHITTAKER expressed his very great pleasure in being asked to second Mr. Fred Smith's proposition, and in so doing he congratulated the members of the Scottish Section on their Golden Jubilee. There was one regrettable shadow in that his old friend, James Bruce, had not lived to see this day. Dr. Whittaker went on to say that Mr. John Boulton and he had been colleagues for a long time in trying to solve some of the problems in dyeing and finishing. He referred to the *time of half dyeing*, but assured members that in John Boulton they would not have a "half-time" President but a full-time one, and he wished him a happy and successful time as President of the Society.

The retiring President, Mr. CLIFFORD PAINE, said: "You have heard the formal resolution put that Mr. John Boulton be our new President for the forthcoming year, as proposed by Mr. Fred Smith and seconded by Dr. C. M. Whittaker, and there being no dissentient voices, I declare Mr. John Boulton elected President."

Mr. Clifford Paine said that it gave him very great pleasure to have the privilege of handing over the Presidential Badge of Office to the new President, and wished him a very successful and happy time during his term of office.

The President, Mr. JOHN BOULTON, then took the Chair, and thanked Mr. Fred Smith and Dr. C. M. Whittaker for the manner in which they had proposed and seconded the proposition that he should take this high office. He did not think any one person should give two speeches in one day, and therefore he was going to get straight on with

the business of the meeting, and his first task, which was a very pleasing one, was to invest Mr. Clifford Paine with the distinguished Past-president's Badge. In paying tribute, he said: "We are very grateful to Mr. Clifford Paine for all his efforts throughout a very successful two years as President of this Society." This was received with acclamation.

6. ELECTION OF ONE VICE-PRESIDENT

The President announced that there had been only one nomination for this vacancy, and therefore he declared Dr. T. Vickerstaff elected a Vice-president for six years. He congratulated Dr. Vickerstaff and the Council on retaining his services.

7. ELECTION OF FIVE ORDINARY MEMBERS OF COUNCIL

The General Secretary reported that 571 ballot papers had been received and there were 6 spoilt papers. The numbers of votes for each candidate were as follows—

G. B. Angus	354
H. Hampson	354
A. E. Stubbs	293
S. R. Cockett	274
C. A. Mills	270
A. P. Kershaw	265
H. à Brassard	258
J. Holt	215
C. P. Atkinson	214

The counting of the votes had been conducted with Mr. R. Grice as supervising scrutineer.

The President declared the following elections to Council—

Mr. G. B. Angus	} to serve for three years
Mr. S. R. Cockett	
Mr. H. Hampson	
Dr. A. E. Stubbs	
Mr. C. A. Mills	to serve for one year

The President congratulated the new members of Council and begged of those members who had not been elected to continue trying in the future.

8. VOTE OF THANKS TO SCRUTINEER

Mr. JOHN BARRITT proposed a vote of thanks to Mr. R. Grice, who had scrutineered the ballot for a number of years. This was seconded by Mr. K. MELDRUM, and agreed.

9. VOTE OF THANKS TO RETIRING VICE-PRESIDENT AND ORDINARY MEMBERS OF COUNCIL

Mr. W. PENN said that, as an ex-Ordinary Member of Council and as a serving Vice-president, he had a first-hand knowledge of what these offices demanded of individuals, and for that reason he could and did propose a sincere vote of thanks to Mr. G. S. J. White, the retiring Vice-president, and to the retiring Ordinary Members of Council—Messrs. A. S. Cluley, J. M. Goodall, A. Thomson, Drs. A. Datyner and T. Vickerstaff.

Mr. R. K. FOURNESS, in seconding, paid particular tribute to Mr. G. S. J. White as the retiring Vice-chairman of Council.

The vote of thanks was declared carried unanimously.

10. ELECTION OF HONORARY TREASURER

The re-election of Mr. A. Waddington as Honorary Treasurer was proposed from the Chair and seconded by Mr. CLIFFORD PAINE, who said nobody knew better than he the beneficial effect Mr. Waddington had brought to the Society. The motion was carried unanimously.

11. ELECTION OF HONORARY SECRETARY

The President said that it was with equal pleasure that he put forward the name of Mr. L. Morton Wood for re-election as Honorary Secretary. This was warmly seconded by Mr. CLIFFORD PAINE, and carried unanimously. Mr. Paine thanked Mr. Morton Wood for his valued support.

12. APPOINTMENT OF AUDITORS

Mr. A. WADDINGTON moved that Messrs. Rawlinson, Greaves & Mitchell, Chartered Accountants, be re-appointed Auditors to the Society for the year 1958. This was seconded by Mr. J. W. REIDY and carried.

13. RESOLUTION FROM THE COUNCIL OF THE SOCIETY REGARDING THE ADOPTION OF A NEW BYE-LAW RELATING TO RESIGNATIONS

Mr. R. J. HANNAY drew attention to this resolution, which was recommended by the Council of the Society after full discussion on 2nd April 1958, but he pointed out that, as it related to an alteration or addition to the Society's Bye-laws, it was necessary to have approval in a General Meeting of members.

The reason for this resolution was to bring this Society's position into line with most other societies. From time to time the officers were embarrassed in dealing with arrears of subscriptions. There was no resolution in the Bye-laws which dealt with the tendering of resignations, and it was felt that this should be rectified.

Mr. R. J. HANNAY therefore moved, Miss E. SMITH seconded, and it was unanimously—

Resolved that any member desiring to resign his or her membership must give notice in writing prior to the 31st December in any year, otherwise he or she automatically becomes responsible for payment of the subscription for the ensuing year.

14. VOTE OF THANKS TO THE CHAIRMEN

Mr. W. G. B. GRANT, Chairman of the Scottish Section, proposed a vote of thanks to Mr. Clifford Paine and Mr. John Boulton for the capable and efficient manner in which they had conducted this meeting. Many kind things had been said about the Immediate Past-president, Mr. Paine, and Mr. Grant thanked him in particular for his reference to Scotland and the Scottish Section Golden Jubilee at the opening of this Annual General Meeting. Mr. Boulton had successfully chaired his first meeting, and Mr. Grant assured him of united good wishes for every success. The vote of thanks was carried with acclamation.

The meeting then terminated.

Annual Dinner

The Seventy-fourth Annual Dinner of the Society was held at the Central Hotel, Glasgow, on Friday evening, 25th April 1958, under the presidency of Mr. John Boulton.

The principal guest was The Right Honourable J. S. MacLay, C.M.G., M.P. (*Secretary of State for Scotland*). Among other guests were The Right Honourable The Lord Provost of Glasgow, Mr. Andrew Hood, Lieutenant Colonel A. R. Marshall (*Prime Warden of the Worshipful Company of Dyers*), Mr. I. S. S. Fotheringham (*Deacon of the Incorporation of Bonnetmakers and Dyers of Glasgow*), Mr. T. Collyer Summers (*Master of the Worshipful Company of Feltmakers*), Mr. H. N. Henry (*Principal of the Paisley Technical College*), Mr. B. Hickson (*Chairman of the Association of British Chemical Manufacturers*), Mr. L. M. Wood (*President of the Dyers and Finishers Association and Honorary Secretary of the Society*), Mr. H. G. A. Anderson (*Convener of the Federation of Chemical Societies in Glasgow*), Mr. H. A. Elkin (*Chairman of the Scottish Section of the Textile Institute*), Mr. D. R. Balfour Park (*Clerk of the Worshipful Company of Dyers*), Mr. C. G. Hulse (*Board of Trade*), Mr. G. W. Bednall (*Editor of "The Dyer"*), Dr. J. Avery, Mr. R. S. Brown, Mr. G. H. Carnall, Mr. A. D. Ferns, Mr. E. Isles, Mr. H. Jones, Mr. G. T. Verrall, Mr. H. Wiles, Mr. T. J. Brown, Mr. P. Caldwell, and Mr. J. K. McCallum (*Founder Members of the Scottish Section of the Society*), Mr. L. E. Jones (*Honorary Patent Agent*), Mr. Clifford Paine (*Immediate Past President*), Mr. J. Barritt (*awarded (1957) the Society's Gold Medal, Honorary Member, and Chairman of the "Colour Index" Editorial Panel*), Mr. K. McLaren (*awarded (1957) the Worshipful Company of Dyers Research Medal*), Mr. F. Atack (*awarded (1957) the Society's Silver Medal and Honorary Secretary of the Scottish Section*), and Mr. W. G. B. Grant (*Chairman of the Scottish Section*).

The following officers and other leading members of the Society also were present—Mr. Fred Smith and Dr. C. M. Whittaker (*Honorary Members and Past Presidents*); Mr. R. J. Hannay, Mr. R. C. Oakley, Mr. W. Penn, Mr. H. A. Turner and Dr. T. Vickerstaff (*Vice-presidents*); Mr. G. B. Angus, Mr. S. R. Cockett, Dr. G. T. Douglas, Mr. F. Farrington, Mr. R. K. Fourness, and Mr. H. Hampson (*Ordinary Members of Council*); Mr. R. Heaton, Mr. W. J. Macnab, Mr. K. Meldrum, Mr. J. Porter, Miss Esmée Smith, Mr. H. W. Taylor, and Mr. H. Turner (*ex-officio Members of Council*); Mrs. Kathleen Cope, Mr. W. R. Leigh, Mr. R. McDonald, and Mr. R. A. Peel (*Junior Branch Officers*); Mr. J. V. Summersgill (*Honorary Secretary of the Publications Committee*); Dr. P. W. Cunliffe (*Chairman of the Fastness Tests Co-ordinating Committee*); Mr. J. W. Reidy (*Chairman of the Finance and General Purposes Committee*); and Mr. A. Waddington (*Honorary Treasurer*).

The total number of diners was 431.

"THE SOCIETY OF DYERS AND COLOURISTS"

After the toast of "Her Majesty the Queen", that of "The Society of Dyers and Colourists" was proposed by—

The Right Honourable JOHN SCOTT MACLAY, C.M.G., M.P. (*Secretary of State for Scotland*), who said that he was extremely glad that this year the Society had chosen to hold its Annual Meeting in Scotland, particularly as it was the Golden Jubilee of the Scottish Section.

In September 1957, when he had opened an exhibition in Glasgow entitled *Colour about the House*, arranged by the Scottish Committee of the Council of Industrial Design, he had expressed the view that for about a couple of centuries Scotland had not paid enough attention to colour. However, Scotland had claims to being considered among the pioneers of colour—and of camouflage. Aniline dyes were being made in Glasgow over a century ago, but the Highland women of two and three centuries ago really knew far more about dyes from a practical point of view than the great majority of their counterparts today. They made their own dyes, gathering the sources from the hillside and producing beautiful warm brown, blue, green, red, and yellow tones from plants and mosses. Spinning their own woollen yarns, our very great grandmothers were able to dye the strands any colour they wished, and when it came to weaving they produced different setts, which developed over the years into the tartans of today. The first setts tended to be sober in hue and blended with the dark greens and blues of the hillside. Later came brighter, more cheerful colours, which, curiously enough, also appeared to be in harmony with the Highland background. But then, the fantastic range of colours which the Highlands can produce in spring, summer, and autumn show that the attractive colour effects of even the more interesting tartans are natural to our country. In November, when the strong colours have become more gentle, the beauty is greater than ever—and that is not just a valiant attempt to get the tourist season extended.

Our dyeing processes go very much further back than that, to a date when some of the early inhabitants of this part of the country, the Picts, dyed not only their clothes, when they wore any, but also themselves. All this does go to show that a desire for colouring in one's life and surroundings must be one of the most fundamental of human instincts. That this pleasing quality went somewhat into abeyance for a couple of hundred years can be due only to the advent of the Industrial Revolution—a very rapid transformation, in the rush of which some of the old values were forgotten. Whatever the reason, there can be no denying that our forebears did succeed in producing a soul-destroying drabness in some of our industrial towns, which has been relieved only by the proximity of the countryside.

It is fortunately very obvious that within the last twenty or thirty years the general public have

become more colour-conscious, and are today demanding a brighter outlook for every facet of their daily lives. We all know of the demands for brighter furniture and brighter houses, outside as well as inside; and for a great many years now the human species has reversed the normal rule of Nature, by allowing the female to be much more colourful than the male. That position is slowly being righted to some extent, for we have our young men appearing today in very brightly coloured suits and shirts and socks, and the latest invasion of colour is into the sphere of men's underclothes.

From all these references it is obvious that the manufacture of dyes is of far reaching importance throughout the world. Although this country of Scotland has a history and a long lineage in this industry, the most substantial development has been at Grangemouth. James Morton, who had experimented with extraordinary rapidity and success following the stoppage of German supplies during the First World War, founded the plant, and from those beginnings grew the present works, which control over 400 different manufacturing processes and make over 330 different products.

This is a field of science in which there is no standing still, and developments not only at Grangemouth but also at Scotland's other centre of the industry, Hawick, famed for woollen garments and tweeds, show that that is the case. The story of progress in Scottish chemicals and other industries is not confined to the larger firms.

One aspect of the value of this industry to our economy in Scotland is its contribution to industrial diversification, which is so necessary to supplement the basic strength of our traditional Scottish heavy industries. The help which the Society can give to the wellbeing of industry here is warmly welcome; and of course, being Scotsmen, we believe that that will ultimately benefit the nation as a whole.

The Society, of course, was founded in 1884, and the group of industrialists in the West Riding of Yorkshire who started it were looking far ahead. There is one object of the Society—to encourage education and research—that is of particular interest to my Department. In the last few years we in Scotland have been involved in a programme for the education of young people, and we are doing much to encourage our younger generation to take up science and kindred subjects as a career. I am very glad, therefore, to see the encouragement which the Society gives to apprentices and young members, and sincerely hope that good advantage is taken of the publications issued, of the diploma examinations held and the awards made, and of the arrangements for training young technologists. In making awards for outstanding contributions to the science and technology of dyeing and colouring, and working closely with similar societies throughout the world, the Society of Dyers and Colourists has set an example which must act as a model to other industrial bodies.

The Society is giving invaluable help also to those new and expanding industries created by the scientific inventions of our day, for example, in the dyeing of plastics and of man-made fibres such

as nylon and Terylene, on which a symposium was held at Buxton last year.

I have learned a great many interesting and impressive things about the Society, and what is particularly interesting is the wide scope of its activity. The preparation of the new *Colour Index* has really been a monumental work and a great tribute to the vast thinking and service your industry is contributing to the country at this time. In 1956 it was this Society which took the lead in organising the Perkin Centenary, paying tribute to the work of its former president, the inventor of the synthetic dye, whose achievement reaches into so many spheres of our life. Next year the Society will have the honour of being hosts to the International Federation of Associations of Textile Chemists and Colourists at their first international congress to be held in Britain, which representatives from all over Europe are expected to attend. I may seem to have covered some familiar ground, but the work of the Society is quite immense and is not known except to those who are specially interested, and I hope in speaking like this that knowledge of the value of this work may be spread more widely.

Mr. JOHN BOULTON, M.Sc.Tech., F.R.I.C., F.T.I., F.S.D.C. (*President of the Society*), thanked Her Majesty's Minister of State for Scotland for his toast to the Society, and referred to the honour which the Lord Provost of Glasgow and he had done the Society by their presence at its Annual Dinner.

Observing with Dr. Samuel Johnson that "much may be done with a Scotsman if he be caught young", Mr. Boulton referred to the distinguished speaker's early progress from Winchester and Cambridge on to a life which had covered commerce, transport, shipping, civil aviation, politics, and sport, all at a level of high distinction.

The President said that the particular business of the evening was to congratulate the Scottish Section on its fiftieth birthday. The Section had started with a nucleus drawn from 26 members then resident in Scotland at large (of that nucleus, five were named *Pullar*). Its initiation was right, coming as a pressure from the students attending the old Well Street College of Dyeing and Weaving, who proceeded to make their teacher, Mr. W. B. Jackson, chairman of the inaugural meeting. Within one year the Section had a membership of 78.

The Scots have always been original in their battle cries—as in so many other things—and when the original discussion on forming a Section was at its most purposeful, a Mr. John Pomphrey rallied the forces of progress by observing: "At present there are more members of the Society in Japan than there are in Scotland, and I hope that the formation of a Section will change that state of affairs." Well, it did and it didn't. Although there are now very many more Scots than Japanese members of our Society—the figures for subscriptions to the *Journal* are Scotland 255, Japan 301. In view of the Scot's proclivity for taking his gifts to remote parts of the world, we have here—as with certain other exports involving the particular

parts of the world concerned—some reason for investigation into certificates of origin!

The year of formation of the Scottish Section was a wonderful year indeed. Professor Raphael Meldola, F.R.S., was the Society's President. The guest at our Dinner was the celebrated Dr. Schreiner. Professors W. Graebe and C. Liebermann were recipients of our Perkin Medal. These names are the very stuff of the history of dyes, dyeing, and finishing. It was also in this year that the decision was taken by the Court of the Worshipful Company of Dyers to award its Gold Medal for researches published by our Society, and the first medal was earned that year: as a Liveryman and your President, I should like to reaffirm to the Prime Warden, who is with us here tonight, the Society's gratitude and the great pride we feel in the fifty years' custodianship of the Company's award. This is a double celebration.

In place of the old Well Street College, Glasgow has now its Royal College of Science and Technology, where the science and the art of dyeing and coloration are studied and taught at a level as high as any in the world. Amongst other distinguished schools there are the Paisley Technical College and the Scottish Woollen Technical College at Galashiels.

I would like to compliment the Royal College of Science and Technology on its report for last year. This showed that eleven Departments in the College have active research programmes—they produced 81 scientific publications and 26 post-graduate Ph.D. theses.

At the First Annual Dinner of the Scottish Section, a speaker, Mr. T. Y. Shand, proposed the toast of "The Glasgow and West of Scotland Technical College": "After referring to the struggle going on for commercial supremacy amongst the nations of the world, and the urgency for technical education, he laid special emphasis on the need for practical scientists, not only theorists who lacked the faculty of the application of their own knowledge. It was a combination of the scientific and practical that was wanted nowadays, and he had no doubt the Glasgow and West of Scotland Technical College would produce men of this stamp."

Scotland has certainly gone on to produce men of this stamp. Though one cannot begin to count up names, one would like to congratulate Dr. C. H. Giles of the Royal College of Science and Technology on writing the first book of practical scientific instruction specifically for the dyer to appear in the English language for a very long time.

This whole atmosphere of fifty years ago—typically Scottish in an intense desire for learning and a desperate intention to make use of learning—was a portent and a prophecy for our Society as a whole. The *Journal* has continued to be the world's foremost source of sound literature in the science and arts of dyeing. The Society's Diplomas are now fully launched, and the A.S.D.C. represents for any apprentice dyer a full and sufficient qualification for him to realise that combination of scientific and practical abilities which was asked for so passionately here in Glasgow fifty years ago.

Since those days the basic scientific theories of dyeing have been largely elucidated in the main from work done and published by members of the Society. It has been felt during this era of theoretical investigation by many of our members that we should show a more practical side to our discussions and publications. It is my own belief that the very high standard of theoretical papers encouraged by the Society has been more than justified. It has, in fact, made the present demand for practical advances a reasonable demand and one for the satisfaction of which the background knowledge now exists.

The call for more practical views is timely. What is wanted now more than anything else—if the technology of dyeing and finishing is to advance with speeds comparable with engineering technologies—is the application of scientific understanding to *technical change*. It is vitally urgent that scientific know-how be translated into industrial efficiency.

Those of us who are tempted to go on crossing the *t*'s and dotting the *i*'s of dyeing theory must apply our skill and our resources to *inventing* rather than *discovering*. If for no other reason—and there are many—than the proliferation of textile fibres now available and the engineering approach which is being brought to bear on their blending and manufacture into fabrics, we must learn new technical and mechanical tricks. Secondly, dyers must be prepared to face radical changes in general techniques. Again, if for no other reason than that dyeing in the main is a batch process wasteful of power and heat and time, we must apply ourselves to the invention of rational continuous methods to a much greater extent than are now available. The discovery of reactive dyes, especially the cold-dyeing type, has brought this much nearer.

The general concept of heating up large volumes of water as a medium for persuading minute quantities of dye on to small batches of fibre in any form whatever is not, unhappily, outmoded, but it ought to be.

During Mr. Paine's Presidency, our Society has done big things. We have seen that great undertaking, the Second Edition of the *Colour Index*, to the point where we wait upon the printer for the last volume. We have taken the lead in the worldwide Perkin Centenary celebrations. We have joined in full membership of the International Federation of Associations of Textile Chemists and Colourists. This last is of the greatest significance.

The provisions of the Rome treaty for the European Common Market came into force this year. Whatever the extent to which the treaty actually operates, there is no doubt that the major producing countries of Western Continental Europe (Belgium, France, Germany, Italy, Luxembourg, the Netherlands) will draw more closely together in terms of customs arrangements, patent exchanges, some replanning of production, etc. This will be reflected in time by much closer liaison in such things as technical and scientific publications, standards of technological training,

and the holding of international technical conferences in place of the present multifarious individual conferences in each country.

Although the United Kingdom is not included in the European economic community, we shall collaborate, in time, in the Free Trade area. And the Society is ready to take part in any international liaison which will develop from the European Common Market by virtue of our recently joining the International Federation of Associations of Textile Chemists and Colourists.

The development of a freely trading community of nations will create problems and opportunities for our industry as for any other. Problems will be the *greater* if freedom to trade is *not* matched by the free and energetic dissemination of technical knowledge. We must be prepared to take part in a flux of investigation, research, and development which is bound to be concomitant with a free trade area. Clearly, in any country which exports it is of importance that the best use be made of their exports in processing and in utilisation if they are to hold their share in competing markets. Thus we all stand to gain from the widest possible dissemination of the most efficient dyeing and finishing methods on the one hand, and, on the other, from raising world standards of technology and technologists wherever they be.

It is precisely these things which are the Society's aims.

Over these years the Society has gone on smoothly and purposefully from strength to strength, in a manner reminiscent of the traditional emblem of the Worshipful Company of Dyers, the swan: through water turbulent or quiet he glides along so smoothly; but always underneath he is paddling like hell!

Finally, I want to pay tribute to the retiring President, Clifford Paine. In his work for the Society during the two years he has been in office he has been outstanding even in a Society which expects a great deal of work from its Presidents. His kindness and help to all of us have led him to spend an unusual amount of time on Society affairs for a man as tremendously occupied as he is. Everything he has done—from the conduct of our major undertakings to the details of our meetings—serves as a model for Presidents who will serve after him.

"OUR GUESTS"

MR. W. G. B. GRANT (*Chairman of the Scottish Section*), in proposing this toast, said that, in the first place, he would like to thank the Council for their wisdom in holding the Annual General Meeting and the Annual Dinner in Glasgow. Secondly, and more personally, he would like to thank them for the honour of being invited to propose this toast, particularly as this was the largest gathering of the Society ever to be held in Scotland. He would also like, on behalf of the Scottish Section, to thank the previous speakers and other guests and members who had said so many kind things and referred so kindly to the Scottish Section and Caledonia in general. We were greatly honoured by the presence of our guests, and it was most gratifying to know that we had not

only the civic blessing of our Society in Scotland but also the satisfaction of having with us no less a personality than the Secretary of State for Scotland. But, of course, we are an important Society and deserve important guests.

We have members in every civilized country in the world, and the importance of this is reflected by the tremendous amount of scientific and industrial development in our industry; this development is brought about, to a large extent, by the fact that the Society is a common ground for discussion between scientists, research chemists, technologists, executives, and those who are operative dyers and colourists.

He would like to add to the welcome given by the President to the Secretary of State and, since he is now one of Her Majesty's busiest Ministers, to say we appreciate very much the fact that he kept this date open for us tonight. Our Secretary of State is not directly connected with chemicals or colour, but there is a very remote connection in that he was educated in Winchester and won his rowing blue at Cambridge. At any rate, he is indirectly connected with every section of the trade. We are very fortunate in Scotland in having a Minister with such vast experience of both home and foreign affairs. His many years of public service cover a very wide field. He was, for example, one of the experts in Washington in the early days of the Second World War who co-ordinated the Allied merchant fleet. Mr. MacLay was also Minister of Transport and Civil Aviation during 1951-1952. He was a member and indeed President in 1955 of the Assembly of Western European Nations, and as Minister of State held office in 1956 in the United Kingdom Delegation to the General Assembly of the United Nations. He has a very logical approach to the country's problems, and he has a toughness of character which we admire very much in Scotland. In welcoming him to the Society we wish him every success in his various tasks in hand, and hope that with his interest in shipping he will navigate the good ship Scotland under new road bridges, over new river tunnels, and perhaps even into a new dry dock.

Our distinguished guests tonight include also Lt. Col. A. R. Marshall, Prime Warden of the Worshipful Company of Dyers, and Mr. D. R. Balfour Park, Clerk to this esteemed body, which gives the Society so much support. We also welcome to our function the Master of the Worshipful Company of Feltmakers and the Deacon of our own Incorporation of Bonnetmakers and Dyers in Glasgow.

As representatives of trade associations we are pleased to have with us this evening the Chairman of the Association of British Chemical Manufacturers and also the President of the Dyers and Finishers Association. We are also very pleased to see the Board of Trade again represented by Mr. C. G. Hulse and to have representatives of technical colleges and other chemical and textile associations with whom we enjoy a close co-operation and a friendly connection.

We extend a hearty welcome to, and are delighted to have with us once again, representatives from great firms in industry—dye-makers, dye-users, and fibre manufacturers—on whom the Society is so dependent for its continued success and prosperity.

As we are celebrating the Golden Jubilee of the Scottish Section it is my privilege and pleasure to present to you, and extend to them a very special welcome, three of our founder members—Mr. T. J. Brown, Mr. P. Caldwell, and Mr. J. K. McCallum. Unfortunately, Mr. J. Heggie, another of our founder members, could not be present tonight. We wish all four a continuance of good health and prosperity for many years to come. I should like to make it clear that quite a number of gentlemen from this part of the world were members of the Society many years before a Section was formed in Glasgow; several are members of 48 or 49 years' standing, proving, perhaps, that they were very good Scotsmen in that they did not wish to join the Society until they had evidence that being a member was well worth the annual subscription. It is pleasing to note that the present Vice-chairman of our Section is a son of Mr. J. K. McCallum.

The position of civic chief, or Lord Provost, in a great city such as Glasgow carries with it immense responsibility, and Mr. Andrew Hood has borne this responsibility with apparent ease. On top of his heavy programme in Glasgow he has found time to visit such places as Washington, Philadelphia, and Detroit, and we can be quite certain that Glasgow could not have had a better representative on such a trip. He will, unfortunately, be giving up office in the very near future, but he will be remembered not only as a man who was popular and dignified in office but also as one who hastened progress in many projects and who as an ambassador was second to none. We are honoured by his presence here tonight, and accept it as a compliment to this Society.

We must ensure that our guests continue to have a very happy and memorable evening, and that, when they leave our city tonight or tomorrow, they will be able to sing with sincerity if not in the correct accent: 'We're no' awa' to bide awa', we'll aye come back and see ye'.

The Right Honourable The Lord Provost of Glasgow, Mr. ANDREW HOOD, in responding to the toast, said that, within ten days of having completed his sentence of three years' hard labour as Lord Provost of the City of Glasgow, this was the largest attended dinner he had seen in that banquet hall. It gave him very great pleasure to convey the congratulations, not only of all his colleagues on Glasgow Corporation, but also of the whole community, on the Golden Jubilee of the Scottish Section of the Society of Dyers and Colourists.

He knew nothing about dyeing, but he was very much interested in colour, and like the Secretary of State for Scotland he believed that we could with

advantage be much more colourful in this sombre country of Scotland. It is true that we indulge in colour to some extent in our various political parties of Scotland, we display colours on occasions, and those of us who are football fans are partial to certain colours at certain times, but the danger is that in discussing colour we very often get into very serious anger. A discussion of colour even leads to domestic strife on occasions.

Now, in Glasgow, which is a very unsatisfactory city in very many ways—a confession that he was sorry to have to make—in Glasgow since the year 1919 over 100,000 houses had been built under the auspices of Glasgow Corporation, which was now the proud owner of 1,000 of the occupied houses in the City of Glasgow. Unfortunately, those 100,000 houses are lacking in the variety of colour which they ought to have. We in Scotland have the reputation of being very sombre, and we could with great advantage be much more colourful than we are. It is to be hoped that, as the Society becomes better known in Scotland, it will be able to bring some influence to bear even on public authorities, and succeed in making them more colourful in their outlook so far as public work is concerned.

The Society's guests had appreciated and enjoyed the generosity and hospitality shown them that evening. He had great pleasure in extending the congratulations of Glasgow on the Scottish Section's celebration of its Jubilee, and in expressing the hope that in future the Society as a whole will have more influence than it has had in the past. Lord Provosts are notoriously ignorant men, and, until he had received the President's letter of invitation to attend this gathering, he had not heard of the Society of Dyers and Colourists. The one constructive suggestion he wished to leave was that the Society might consider the advisability of having a publicity department, so that future Lord Provosts of the City of Glasgow who are invited to attend the Annual Dinners will appreciate exactly the significance and the importance of the Society whose guests had been so exceedingly happy on this very special occasion.

AWARDS

The President announced that the Research Medal of the Worshipful Company of Dyers for 1956-1957 had been awarded to Mr. Keith McLaren.

The President then presented the Gold Medal of the Society to Mr. John Barritt, awarded for exceptional services to the Society as Chairman of the *Colour Index* Editorial Panel; and the Silver Medal of the Society to Mr. Fred Atack for services to the Society as Honorary Secretary of the Scottish Section since 1947.

Finally, the President expressed thanks to the House of Fraser for the beautiful tartan decorations round the room.



JOHN BARRITT
B.Sc., A.R.C.S., A.R.I.C., F.S.D.C.
Gold Medal for exceptional services to the Society
as Chairman of the *Colour Index* Editorial Panel



KEITH McLAREN
B.Sc., F.R.I.C., F.S.D.C.
Worshipful Company of Dyers Research Medal for
1956-1957, for a series of papers on light-fastness
testing and fading of dyes



FRED ATTACK
Silver Medal for services to the Society as Honorary
Secretary of the Scottish Section since 1947

Some Aspects of Bleaching with Hydrogen Peroxide and with Peracetic Acid

L. CHESNER and G. C. WOODFORD

Meetings of the London Section held at the George Hotel, Luton, on 5th April 1957, Dr. H. W. Ellis in the chair; and of the Manchester Section held at the Textile Institute, Manchester, on 18th April 1958, Mr. J. W. Reidy in the chair

The methods and the theory of the bleaching of some of the principal textile fibres with hydrogen peroxide and peracetic acid are discussed. Observations are included on the greater ease of soil removal from bleached wool in relation to washing processes and the rôle of stabilisation in cotton-bleaching processes. Improvements to existing bleaching methods are given, with particular reference to the use of per acids in kier bleaching, and some data are presented on the decomposition of dilute solutions of peracetic acid.

Introduction

The bleaching of textile materials used to be regarded as an art or a skilled craft rather than a science. Today, it would be more truthful to say that it is a science satisfying an aesthetic need, since the prime purpose of bleaching is to enhance the finished appearance. This is accomplished by removal of colouring matter imparted by Nature or of discoloration imparted by man, e.g. during heat-setting processes. In addition, the colour may have been deposited by micro-organisms or developed by chemical changes such as occur in flax retting and in drying. In some instances, however, purification rather than whitening is the principal aim of bleaching, as with surgical cotton, gauze, and towelling.

The definition of bleaching given by the Terms and Definitions Committee of the Textile Institute is¹—

The procedure, other than by scouring only, of improving the whiteness of textile material, by decolorising it from the grey state, with or without the removal of natural colouring and/or extraneous substances.

From a practical standpoint, of course, bleaching should proceed without degrading the fibre to any appreciable extent.

Hydrogen Peroxide

One of the earliest industrial uses of hydrogen peroxide, in 1880, was as a reagent for bleaching straw hats in Luton.

Hydrogen peroxide as a bleaching agent has the advantages of being an easily handled odourless liquid, which is available in a convenient and safe form. In use, it is economical and labour saving, strengths of bleaching solutions being easily maintained, and, as there are no undesirable decomposition products, the bleached material may be left with a permanent white in an odourless state.

A major factor which has contributed to the popularity of hydrogen peroxide is the extremely high stability of the present-day product. This is in strong contrast to that which was manufactured twenty or thirty years ago.

In addition to the fact that this inherent stability results in virtually no loss in strength during handling or storage, it enables complete control to be exercised on the rate of peroxide decomposition during bleaching.

The product commonly sold to textile bleachers is 35% by weight, which is of approx. 130-vol. strength.

WOOL BLEACHING

The cause of the yellowish tinge in wool has not been determined, although one interesting theory on its origin attributed part of the colour to disulphide bonds acting as chromophores². On this basis, one would consider that the chromophoric groupings responsible for colour are eliminated by bleaching.

Another view is that the different colours of the natural pigment indicate different oxidation stages of the original substance, and the cream colour of wool or the blond tint of human hair, and its final white in later years, represent the highest oxidation stages of the natural pigment³.

The bleaching of wool with hydrogen peroxide has been firmly established for a long time, although the techniques have been improved with the passing years. These fall under three principal headings—

- (1) Alkaline steeping processes
- (2) Acid processes followed by ageing
- (3) Ferrous mordant process for pigmented wools.

Alkaline Process

The alkaline process is essentially a steeping method, and was in use before 1890, when ammonia or sodium silicate was used to obtain the necessary alkalinity. Its greatest use is for hosiery yarn and fabric.

The method is simple to operate, the wool being merely steeped for 2–12 hr. or overnight at a temperature not exceeding 120°F. in a 1–4-vol. hydrogen peroxide solution containing stabilisers such as phosphates and sodium silicate or Stabiliser C (a blend of phosphates and oxalates designed to promote optimum bleaching results).

Steeping methods have been extended to bleaching cones in package machines, where to obtain a bottom prior to dyeing a 2–3-hr. treatment in a 2-vol. peroxide bath is necessary.

Acid Process

The acid bleaching process, on the other hand, is based on a system of padding on to the wool an

acid solution of hydrogen peroxide followed by immediate drying or ageing.

A development of the acid ageing technique has been the introduction of Stabiliser MP (based on acid fluorides), which, in addition to its stabilising properties, gives moth resistance up to the time of the first washing. Thus, for the same bleaching cost, temporary mothproofing is imparted to the wool during its period of storage in warehouses and shops. This method finds its main outlet for blankets, where a maximum bleaching effect is not required and other factors such as improvement in the raising properties of the fibre have to be taken into consideration. It also allows the use of a wider selection of dyes for coloured headings.

Another variation of the acid peroxide padding technique is the bleaching of loose wool in the last bowl of the scouring set. A 1-2-vol. hydrogen peroxide bath is used, adjusted to pH 4.0-5.0 with formic acid. In both acid and alkaline bleaching processes the liquor can be regenerated. Acid solutions of peroxide may run for a month or longer without changing the solution, the life of the bath depending primarily on the cleanliness of the loose wool.

Chemical modification as indicated by alkali solubility is much lower than with steeping by alkaline bleaching, as shown by the figures in Table I, obtained on a sample of Merino wool bleached in a 4-vol. bath by both methods. The degree of whiteness obtained with the relatively mild acid bleach, however, is not equal to that obtained by alkaline steeping methods.

TABLE I

Treatment of Loose Wool Samples	Alkali Solubility (%)	Reflectance (%)
Scoured only ...	10.2	54
Scoured and bleached (pH 4.0 at 70°F.) ...	18.5	62
Scoured and bleached (pH 9.0 at 120°F.) ...	31.0	67

Backwashing

A recent use of hydrogen peroxide in bleaching wool is in the manufacture of worsted tops, bleaching being carried out as the wool sliver passes through the second bowl of the backwashing machine.

The wool is immersed in the bleaching solution for approx. 5 sec., depending upon the speed of the machine. A 1-4-vol. bath at 100°F. is used at a pH of 6.0-8.0. It is usually maintained at this pH by the addition of small quantities of formic acid or stabiliser to neutralise excess carryover of alkali or soap.

Wool fibres are generally found to respond readily to combing at this pH. There is also no danger of corrosion to the pins of the Noble comb or gill boxes. The take-up of hydrogen peroxide is dependent on the sorption by the wool and the pressure of the squeeze rollers. Bleaching continues for 24-48 hr. after drying, i.e. during the combing process, and finally during storage in the finished top state by ageing principles. The method also finds use in the rejuvenation of tops yellowed by storage.

The danger of fouling the bleach liquor is less than in loose wool scouring and bleaching, as the wool is initially in a much cleaner state. Since the backwashing bowl is comparatively small, the wastage of hydrogen peroxide is not great if the liquor is run to waste, and this is usually done once a day.

Ferrous Mordant Process

The stimulus for reducing the dark colour of pigmented fibres was provided by the war years 1939-1945, as there had previously been a tendency to regard these mongrel fibres as outcasts, against which a "colour bar" was in operation. They have now found a real place in the carpet and blanket industries.

Evidence has been obtained that the pigment of the dark-coloured wools is melanin, occurring as granules in the superficial layer of the fibre⁴, whilst its presence in the form of a melanoprotein has also been suggested⁵. The granules when examined under the electron microscope bear shapes which vary according to the type of fibre in which they are contained⁶, and their distribution along the fibre axis is related to fibre crimp⁷.

The interesting observation of the affinity for metals possessed by the pigment of these wools⁸ is utilised in commercial bleaching methods. The view is sometimes held that the catalytic effect of iron and its salts on hydrogen peroxide is a failing. This "failing", however, is harnessed and becomes an asset for bleaching pigmented wools. By limiting the amount of iron used, its catalytic action is utilised in obtaining a higher degree of bleach than is otherwise possible. Some of this iron is retained within the fibre walls, presumably in close proximity to the pigmented matter, enabling catalytic activation to take place at the pigmentation sites with the possible formation of a metal-melanin-protein complex⁹.

The bleaching method utilises an initial ferrous mordanting treatment for 2 hr. in the presence of formaldehyde, which exerts a protective influence on the wool, followed by an alkaline hydrogen peroxide bleaching treatment for 2 hr. The stringency of the treatment varies for different types and depths of pigmentation.

Summary

From the practical point of view of the bleacher and dyer, the effects of hydrogen peroxide can be summarised as follows—

1. Enhanced appearance of wool by producing a permanent white, not to be confused with additional temporary brightness obtained from sulphur stoving, fluorescent brightening, or tinting.

2. Depending on the end-use of the product, alkaline or acid conditions may be used, the former resulting in a soft handle, the latter giving a more resilient handle.

3. The chemical modification and variations in dyeing between bleached and unbleached wool depend essentially on the type of bleach employed. Thus with acid-pad-age methods the alterations in dyeing are no greater than one might expect considering that the fugitive natural colouring matter has been removed. With alkaline steeping

methods, the higher degree of chemical modification results in a reduction of dye take-up and exhaustion rates, which assists the production of level dyeings. The difference in dye take-up between unbleached and bleached wool is probably due to the introduction of sulphonic or sulphenic groups into the wool molecule, making it less basic in character. After bleaching by either the acid or the alkaline process, subsequent dyeing results in clearer pastel colours and brighter medium depths, which have improved light fastness because of the removal or modification of the fugitive pigment.

Soiling

Another interesting advantage of the peroxide bleaching of wool has been shown in the laboratory in connection with subsequent washing or laundering. From this standpoint the bleaching treatment would appear to be a major factor in determining the ease of surface soil removal, probably because of the chemical modification which the fibre undergoes during bleaching. When soap or synthetic detergents are used, the degree of soil removal from peroxide-bleached wool is greater than from unbleached wool, and, the greater the degree of bleaching, the more easily is soil removal effected. This may be associated with the fact that hydrogen peroxide treatment causes the tips of the scales to be loosened from the fibre⁹. This could render the physical anchorage of dirt particles more difficult from the standpoint of increasing the resistance of bleached fibres to natural soiling, as well as facilitating soil removal during washing and rinsing processes.

To illustrate the effect, samples of peroxide-bleached and unbleached doubly scoured tubular-knit fabric were artificially soiled from a fine dispersion of vacuum-cleaner dust particles suspended in carbon tetrachloride. The fabric specification was 24 courses, 22 wales per inch made from 64s-quality wool spun into 2/32s yarn. The samples were washed for 10 min. in solutions of various detergents which contained equal concentrations of surface-active agent in a Pegg Barrow machine used as a wash wheel at a liquor ratio of 10:1 and a temperature of 110°F.

The reflectance results shown in Table II were obtained on an EEL reflectometer using an Ilford narrow-band filter No. 602. Detergent A is based on an alkali washing process using an alkyl sulphate detergent. Detergent B is based on a commercial acid wool washing laundry process using a non-ionic detergent¹⁰.

Check tests were carried out using bleached and unbleached wool fibres chopped into 0.5–1.0 mm. lengths and artificially soiled with a standard

mixture of graphite and fatty matter¹¹. The fibres were then agitated in detergent solutions at 110°F. for 15 min. under standard conditions¹², and the increases in reflectance determined by forming pads on a Büchner funnel.

The graphite soiling mixture is more homogeneous and less variable in character than vacuum dust, but gives a lower response when washed. The results obtained nevertheless showed good correlation with the material soiled with vacuum dust.

It is obvious that the increased efficiency of the acid washing process cannot be explained on the basis of increased repulsion due to the presence of similar electric charges on dirt and fibre resulting from the detergent, since the use of non-ionics does not greatly alter the charge on either the dirt or the fibre. The answer may be associated with the following—

(1) The swelling of wool being less in the isoelectric region reduces the possibility of ingress of dirt particles into the fibre surface.

(2) The substantivity of the detergent on the fibre. Thus anionics, being more substantive than non-ionics, are adsorbed to a greater degree and leave less detergent available in solution for emulsification purposes. It was also confirmed during the course of this work that the use of anionic detergents was less effective in an acid medium than in an alkaline medium, and that non-ionic detergents were less effective on wool in an alkaline than in an acid medium.

COTTON BLEACHING

There are two classes of impurities present in cotton—those which occur naturally, such as motes, waxes, pectins, and pigments, and those which are introduced by man to facilitate spinning and weaving, e.g. oils and sizes. The purification methods fall into three groups—desizing, scouring, and bleaching. Sometimes all three are carried out in sequence, whilst in other instances one or two are dropped, since the use of peroxide for bleaching often enables one or both of the first two processes to be omitted.

The traditional methods of bleaching in this country aim at removing as much impurity as possible by prolonged desizing and boiling treatments, so that the actual bleaching process is carried out on almost pure cellulose. The question arises, however, whether this type of stringent treatment is necessary in order to attain a high standard of bleach with peroxide, and whether in fact such a high cellulose purity as that to which we have been accustomed is necessary for the majority of bleached goods. A more realistic

TABLE II

Washing Process	pH at Start of Washing	Reflectance (%)		Increase in Reflectance (%)	
		Bleached	Unbleached	Bleached	Unbleached
Soiled original	—	30.4	29.8	—	—
0.18 g. Low-titre soap (90%) + 0.40 g. sodium sesquicarbonate per litre	9.6	43.2	37.0	12.8	7.2
1.28 g. Cationic detergent (12.5%) + 0.40 g. sodium sesquicarbonate per litre	9.8	42.7	36.7	12.3	6.6
1.0 g. Detergent A (16.0%) + 0.40 g. sodium sesquicarbonate per litre	9.8	46.7	39.0	16.3	9.2
2.0 g. Detergent B (8.0%) per litre	6.0	52.0	43.0	21.6	13.2

attitude is that the end-use of the product should more closely govern the severity of the process.

From this standpoint, and from the points of view of coloured woven goods and blends of cotton with other fibres, the emphasis in bleaching practice is veering to the use of milder bleaching agents and to shorter and milder bleaching treatments. This trend is not surprising, since we are steadily moving into an era of increasing labour costs. Justification for the milder treatments can also be found on technical grounds, since the property of high absorbency which is usually desirable in bleached goods does not always occur after a lengthy stringent scour, and is not necessarily due to removal of waxes. For example, highly absorbent cottons, which have been given a preliminary scouring treatment in caustic soda, have been found to have a residual wax content (ether extract) after bleaching of 0.6%, which indicates that the kiering process does not necessarily remove all the cotton waxes.

Research carried out by several workers has indicated that the whole of the cotton wax is situated in the primary wall of the fibre¹³ and that absorbency is related to rupture of this primary wall rather than removal of the cotton wax¹⁴. Complete removal of the primary wall has been shown to occur after a kier boil-hypochlorite sequence¹⁵, but the fact that this occurs is considered to be incidental rather than a prerequisite to production of an absorbent cotton.

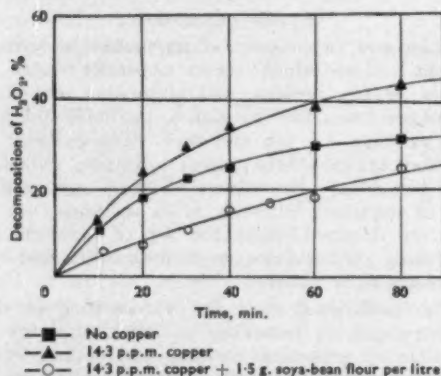


FIG. 1.—Effect of Protein Addition on the Decomposition of a 2-vol. Bleaching Solution containing Copper (liquor ratio 20:1; 190°F.).

The reasons for the removal of impurities prior to traditional methods of bleaching do not apply in the case of peroxide, since there is no danger of formation of chloramines or other by-products of the bleaching process which might later impair whiteness and strength. Chloramines are avoided as much as possible in hypochlorite bleaching by carrying out efficient scouring beforehand, and this effects a considerable reduction in the protein content. In peroxide bleaching, scouring is often unnecessary, and the presence of proteins has, in fact, been found advantageous in producing greater stability of the liquor (Fig. 1). The enhancement of stability imparted by the protein varies slightly according to its source. Some of the proteins and degraded polypeptides with which satisfactory results have been obtained in the presence of silicate-stabilised liquors include soya-bean flour, gluten, dissolved wool, egg albumen, and dried blood albumen. A further advantage of proteins incorporated in a peroxide system is that they enable bleaching to proceed with a reasonable margin of safety in the presence of copper contamination, which may be unavoidably present on the fabrics or in the water supply.

The following are considered to be the main reasons which enable the use of hydrogen peroxide to provide rapid bleaching with low damage—

- (1) Full use of the stabilising properties of natural cotton impurities to minimise peroxide consumption
- (2) High alkalinity at elevated temperatures producing efficient scouring action
- (3) Bleaching and levelling of residual waxes
- (4) Solubilisation of starches.

The application of a combined scour-bleach process for cotton using hydrogen peroxide in winch, package, and Hussong machines is now well established, and *British Pharmacopoeia* specifications have been met by this one-stage process on material such as cotton gauze, lint, and bandage cloth.

Bleach Bath Stability

A stable bath is important to the bleacher, since it enables him to exercise a degree of control on the rate of bleaching, to utilise his chemicals economically, and to obtain the desired standard of whiteness with the minimum degree of chemical

TABLE III
Effect of Stabilisation of Bath

Bath—	Sample 1 Correctly stabilised	Sample 2 Unstable	Sample 3 Unstable
H ₂ O ₂ , vol. ...	0.5	0.5	0.5
Na ₂ SiO ₃ *, g./litre ...	7.0	—	—
Na ₂ CO ₃ , g./litre ...	1.7	1.7	1.7
NaOH, g./litre ...	0.5	—	—
CuSO ₄ , g./litre ...	—	—	0.1
H ₂ O ₂ after 2 hr., vol. ...	0.21	0.05	—†
Fluidity after bleaching (original value 2.5) ...	3.5	4.3	8.5
Reflectance, % ...	95.0	93.1	84.5

* Pyramid Brand No. 1 (Joseph Crossfield & Sons Ltd.) used throughout.

† Completely decomposed after 45 min.

damage. Stability is therefore fundamental to the peroxide bleaching process.

This is illustrated in Table III, which shows the results obtained in the bleaching of three samples of knitted cotton fabric in a 0.5-vol. solution at 200°F. Bubbles of oxygen were freely evolved from the unstabilised systems only, which, in addition to causing wastage of hydrogen peroxide, resulted in poorer whiteness and increased chemical damage.

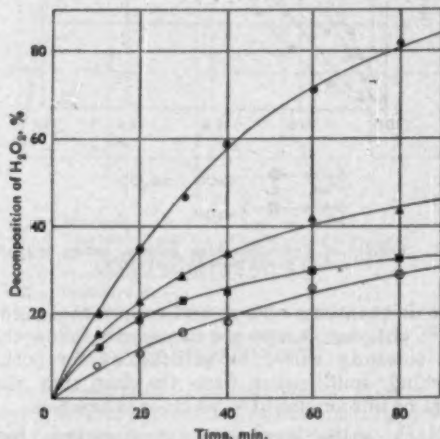


Fig. 2—Decomposition of 2-vol. Bleaching Solution in the Presence of Copper-contaminated Cotton (liquor ratio 20 : 1; 190°F.)

Fig. 2 shows another means of substantially reducing the adverse effect of copper (in addition to partially solubilising the starches), by pre-treating with a peroxy acid.

Perhaps the most useful stabiliser in practice is sodium silicate; but, surprisingly enough, Nature makes her own contribution in the form of the water-soluble impurities found in the grey cotton, motes, and husks. These impurities include proteins, pectins, and mineral salts.

The value of sodium silicate would appear to lie in its buffering capacity and its ability to form complexes with various metal ions which are less catalytic than the parent metal or salts.

Although no iron silicate complex is known, it may well be that some such substance is formed, preventing the formation of ferric hydroxide, which is known to be strongly catalytic in its action on hydrogen peroxide. The order of addition of chemicals to the bleach bath is important, partly on account of this desirability of eliminating unwanted hydroxides. It is, therefore, recommended that the order of additions should ideally be magnesium sulphate, sodium silicate, soda ash, caustic soda, and hydrogen peroxide¹⁴.

It is important to disperse the silicate in solution before adding the caustic soda, in order to prevent precipitation of alkaline-earth hydroxides. The use of magnesium sulphate (about 0.1–0.2 g./litre) in the presence of excess sodium silicate helps to

confer improved stability where industrial condensate or a soft water supply is used for bleaching, and where small amounts of dissolved iron or copper impurities may be present. Such impurities can often be traced to the commercial grades of alkalis used as auxiliaries in the bleaching process, as well as to the water supply itself. Water of at least 2° hardness is generally satisfactory for preparing very stable baths. This can be attributed to the effect of calcium or magnesium silicate, or both, derived from the natural hardness salts in the presence of excess sodium silicate. Hard waters are obviously less satisfactory as rinsing media, but fortunately the amount of rinsing water needed after peroxide bleaching is considerably less than in conventional bleaching methods. Water in the region of 2–7° hardness may be considered to give a good compromise between stabilising and rinsing effects.

Another useful stabiliser recently investigated is triethanolamine, which helps to impart a softer handle to the goods than sodium silicate plus caustic soda. Mixtures of triethanolamine and silicate have been used with some success.

The final $\text{Na}_2\text{O} : \text{SiO}_2$ ratio present in any bleach bath will be dependent on the choice of silicate and the quantities of either caustic soda or soda ash or both added.

One cannot be definite about the ratio required in a bleach solution, owing to the variations in quality of cotton, degree of pretreatment, liquor ratio, equipment used, type of water, and bleaching temperature, and the desire to avoid depositing silica on the fabric. The following is a typical cotton-bleaching formula, giving an initial pH of 10.3–10.8, which is considered to provide a balanced $\text{Na}_2\text{O} : \text{SiO}_2$ ratio in solution—

	% on Wt. of Material
Hydrogen peroxide (35% by wt.)	2.0–8.0
Sodium silicate (8.8% Na_2O + 29.0% SiO_2)	3.0
Soda ash	0.8–1.0
Caustic soda	0.4–0.6

Fig. 3–5 are based on bleaching solutions containing silicate, in which the total alkalinity has been derived from caustic soda in one case, and has been equally divided between caustic soda and soda ash in the other. The silicate alkalinity is considered as caustic alkalinity.

It will be seen that the shapes of Fig. 3 and 4 are closely similar. It would be misleading, however, to deduce that the variations in stability shown in Fig. 3 are solely due to differences in pH.

At any given pH value between 10 and 11, which covers the principal bleaching range in the above system, the alkali concentration and the rate of peroxide decomposition produced by the mixture of soda ash and caustic soda are greater than those provided by the caustic system alone. High alkali contents are considered to be desirable in assisting purification of the goods and reducing the risk of silica deposition. The apparently lower stability produced by the mixed alkali system (Fig. 5) is due primarily to the fact that, for any pH in the range shown, the $\text{Na}_2\text{O} : \text{SiO}_2$ ratio is greater

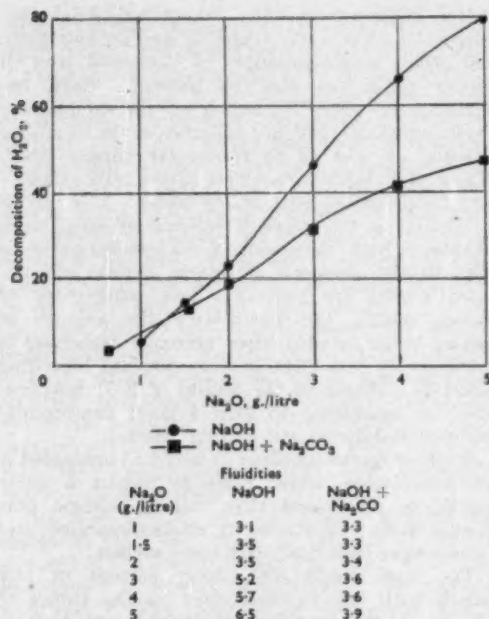


FIG. 3—Effect of Varying Na_2O Concentration in 1-vol. Cotton-bleaching Solution containing 2 g. SiO_2 per litre (liquor ratio 20:1 at 190°F.).

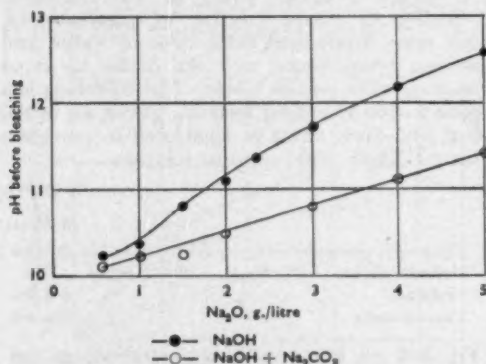


FIG. 4—pH Values of Cotton-bleaching Solutions of Varying Alkali Contents containing 2 g. SiO_2 per litre

than in the caustic system. The graphs therefore help to substantiate the assertion that the Na_2O : SiO_2 ratio rather than pH alone is the important factor in stabilisation.

It will be noted (Fig. 4) that the buffering capacities of the two systems follow the same general pattern over the Na_2O : SiO_2 range tested, and tend to be slightly superior in the case of the mixture of soda ash and caustic soda.

In kier bleaching practice a satisfactory SiO_2 content is around 2.0–2.5 g./litre, and the most effective results are obtained with Na_2O contents varying from 2 to 3 g./litre.

It is of interest that, when water and chemicals of the greatest purity are used, bleach solutions of very high stability based on caustic soda can be made in the absence of sodium silicate. These solutions remain very stable even in the presence

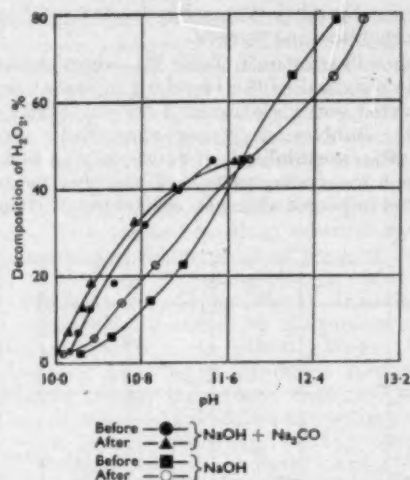


FIG. 5—Stability of Cotton-bleaching Solution before and after Bleaching (liquor ratio 20:1 at 190°F.).

of small quantities of iron and copper contamination¹⁵, although it does not necessarily follow that such solutions would be satisfactory for cotton bleaching, quite apart from the fact that they would be uneconomical to produce in practice.

Bleach baths comprising grey cotton, hard tap-waters, and commercial grades of chemicals contain both catalysts and inhibitors of hydrogen peroxide decomposition, but the net influence is invariably a pronounced degree of stabilisation, together with a good standard of bleach when a balanced silicate-based formula is used.

The stabilising effect of natural water-soluble impurities found in cotton is illustrated in Fig. 6 and 7. Fig. 6 refers to a bleaching solution prepared with distilled water in the absence of cotton, whilst Fig. 7 demonstrates the effect of adding cotton to the system.

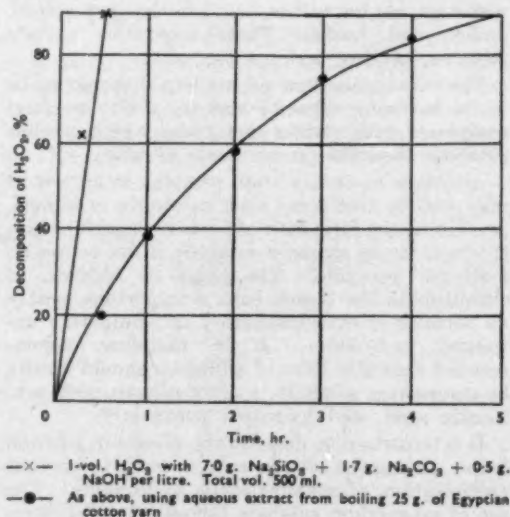


FIG. 6—Stability of 1-vol. Bleaching Solution at 190°F.

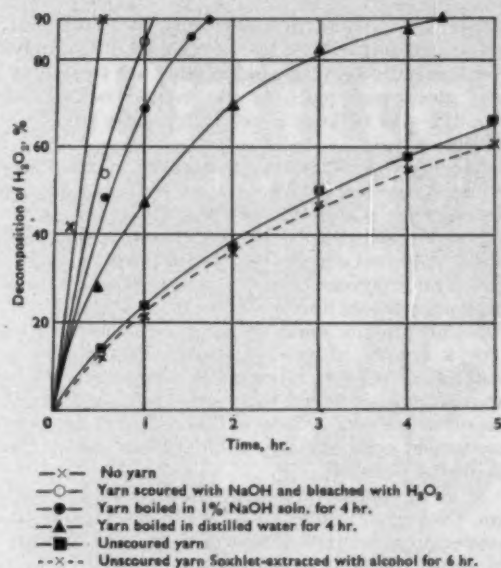


FIG. 7—Stability of 1-vol. Bleaching Solution (liquor ratio 20:1 at 190°F.)

It is evident that fairly pure cotton plays a very minor rôle as a stabiliser, whereas unscoured yarn helps to produce a highly stable system. It is therefore not surprising that a peroxide bleaching process, from which scouring has been omitted, often produces a superior white with less chemical damage than is obtained with bleaching after a prescour. Fabric weight and structure are nevertheless crucial factors, so that in bleaching a heavy woven fabric containing tightly twisted yarns, a mild prescour may be needed.

Peroxide bleaching can be carried out in most equipment commonly used in the textile industry, particularly when it is constructed of stainless steel, as is the case with many winch, package, jig, and Hussong machines. Bleaching may also be carried out in kiers, but since these are usually constructed of mild steel, they must be lined with a coating of silicate cement before use. The most durable lining, with high resistance to abrasion, is formed by brushing on to the inside surface a slurry of sodium silicate and Ferrocrete (Cement Marketing Co. Ltd.) rapid-setting cement.

It must not be taken as axiomatic that, because hydrogen peroxide decomposition is catalysed by iron, and the latter causes severe staining and tendering of cotton fibres, iron vessels cannot be used. In certain bleachworks it has been noted that, where iron components have previously been in intimate contact with highly alkaline solutions for long periods of time, viz. months or years, the metal has had no adverse effect whatsoever on the efficiency of the bleach, and no staining has occurred. No explanation has yet been found for this phenomenon, which cannot be reproduced by rendering iron passive by any of the known methods, and therefore one must not draw generalised conclusions that bare iron components should be tolerated, although the observation is worth recording.

Soda Ash Scald

Depending on the type of equipment used, up to 50% of the peroxide may be left unused on the conclusion of bleaching processes. Whereas the normal practice is to wash away this residual peroxide, a proportion of it may be fully utilised by dropping the liquor on the conclusion of bleaching and carrying out a final hot scald treatment in the presence of a 2% soda ash solution containing a small quantity of wetting agent, to which may be added, if necessary, a small quantity of magnesium sulphate for stabilising purposes. These, together with the silicate and natural impurities present, utilise the residual bleaching properties of the peroxide absorbed by the fibres and result in more efficient chemical usage, with a consequent improvement in whiteness, absorbency, and handle.

Continuous Bleaching

Probably the most economical methods of bleaching with hydrogen peroxide are the continuous processes extensively developed in the U.S.A., in which interest has now spread to Great Britain and Continental Europe, where several plants are in operation, some of which incorporate the J design whilst others are variations on the same principle.

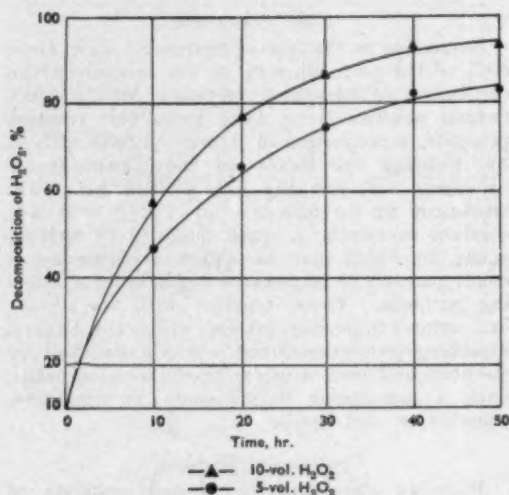
A significant stage has now been reached in this country, since stainless-steel continuous plants made by British manufacturers are now available for both open width and rope form. The first open-width unit, which was made by the Spooner Dryer & Engineering Co. Ltd., has been operating for three years in Lancashire in bleaching material containing vat- and azoic-coloured fabrics.

The merits of continuous bleaching can be summarised as follows—

1. Saving in labour
2. Saving in time due to speed of bleaching
3. Savings in chemicals, water, and steam. (In heating the cloth, only sufficient steam to raise it to the desired temperature is allowed to enter the heater)
4. A uniform and reproducible bleach is obtained, since channelling problems do not arise, and the loss in weight after bleaching is low
5. A continuous bleaching range is a compact and tidy unit which occupies little floor space
6. It provides first-rate working conditions compared with the old-fashioned type of bleach-croft.

Cold Pad

In contrast to the use of the above type of expensive equipment, it is interesting to note that bleaching can also be effected with hydrogen peroxide by the use of a simple cold padding process. This method can be used on existing simple equipment, such as pad mangles and washing machines, and has been successfully adopted on fabrics ranging from open-mesh gauzes to closely woven duck cloths.



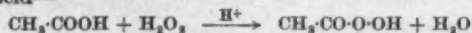
	Original	16-hr. Bleach (a)	24-hr. Bleach (b)	48-hr. Bleach (c)
5-vol. ...	65.0	84.5	86.0	86.5
10-vol. ...	65.0	85.0	86.0	87.0
(b) followed by 1% Na ₂ CO ₃ Scald (10 min. at 180°F.)				
Reflectance, % ...	...	90.0	...	93.8
Wettability, sec. ...	...	< 1	...	< 1
Fluidity (original 2-4) ...	...	2.9	...	3.5
High-temp. Bleach (2 hr. at 190°F.)				
Reflectance, % ...	...	...	...	93.8
Wettability, sec. ...	...	...	...	< 1
Fluidity (original 2-4) ...	...	...	...	3.5

FIG. 8—Cold Bleaching of Cotton Cloth with Hydrogen Peroxide (4.5 oz./yd.; 2/2 twill; 44 ends, 46 picks per inch; H₂O₂ stabilised with 20 g. Na₂SiO₃ + 5 g. Na₂CO₃ + 5 g. NaOH per litre)

The process consists in padding the cloth at room temperature with a highly stabilised solution of 5-vol. hydrogen peroxide and leaving it covered with a plastic sheet for 24 hr. Depending on the amount of storage space available, this system of bleaching can be adopted for long or short runs. Cotton blends of viscose rayon or cellulose acetate are ideally suited to the process, whilst the increased chemical costs are more than outweighed by the reduction in labour costs compared with conventional methods. Some indication of the scope of the process is given in Fig. 8.

Peracetic Acid

This product is made by the action of concentrated hydrogen peroxide on acetic acid in the presence of a strong mineral acid such as sulphuric acid—



It is available as a clear colourless solution of 36–40% strength, and although the stability is adequate for bleaching purposes, it does not approach that of hydrogen peroxide. Peracetic acid is inflammable, and burns smoothly with a flame which can be almost invisible. The product is packed in polythene demijohns with self-priming siphons if required for transferring it directly from its original container. Since the concentrated solution, which has a pungent smell, is corrosive and can burn the skin, it is preferable to siphon rather than pour it from containers. All spillage should be quickly washed away with cold water. Dilute solutions have a fungicidal and bactericidal

action¹⁷. The acid is water-white in colour and has a similar solubility to acetic acid. The only precautions to be taken in handling are to keep it in a clean cool place in the vented containers supplied, and to keep naked lights away from the storage vessel.

Average figures for loss in strength at 20°C. are 1.0–1.2% per week. The available oxygen due to the peracetic acid in the 40% product is 8.4%, and, although the acid contains some free hydrogen peroxide, this never exceeds 6%, and is normally 3–4%. The organic peroxides, of which peracetic acid is an example, contain the weak peroxide bond, which is readily broken under appropriate conditions to give a supply of free radicals. This potential instability helps to give these compounds their unusual properties and their present-day industrial importance¹⁸. The free radicals formed by peracetic acid no doubt play an important part in the bleaching process.

It is, of course, important that the acid should not come into contact with certain metals such as copper, iron, and manganese or their salts, in order to avoid catalytic decomposition.

Table IV gives an indication of the stability of a dilute solution of peracetic acid of similar strength to that used in textile bleaching.

TABLE IV
Stability of Dilute Peracetic Acid Solution
(Initial concn. of soln. at 20°C. 3 g. of approx. 37% peracetic acid per litre; pH 2.8)

Time (hr.)	Available O due to H ₂ O ₂ (% of initial concn.)	CH ₃ CO-O-OH (% of initial concn.)
0	15.8	84.2
2	16.1	83.9
4	16.1	83.9
6	16.4	83.6
24	17.8	82.2

The hydrogen peroxide was determined by titration against ammonium ceric sulphate below 10°C., and the peracetic acid remaining in the solution was determined by continuing the titration with sodium thiosulphate after the addition of potassium iodide. It will be noted from the figures that the degree of hydrolysis after 24 hr. is only slight.

NYLON BLEACHING

Peracetic acid was developed commercially for the removal of heat-setting discoloration from nylon, for which it is a most useful bleaching agent.

A suitable bath contains, per 100 gal.—

3 lb.	Peracetic acid (36–40%)
4 oz.	Calgon
1–2 lb.	Wetting agent

The bleaching solution is adjusted to pH 7 with caustic soda, the temperature raised to 180°F. in 30 min., and heating continued for a further 30 min., by which time bleaching is complete. Stainless-steel vessels are ideal, and corrosion problems due to the acid are non-existent. If required, fluorescent brightening agents may be added to the bleach liquor.

Table V shows the effect of pH variation in bleaching a knitted 30-denier nylon fabric.

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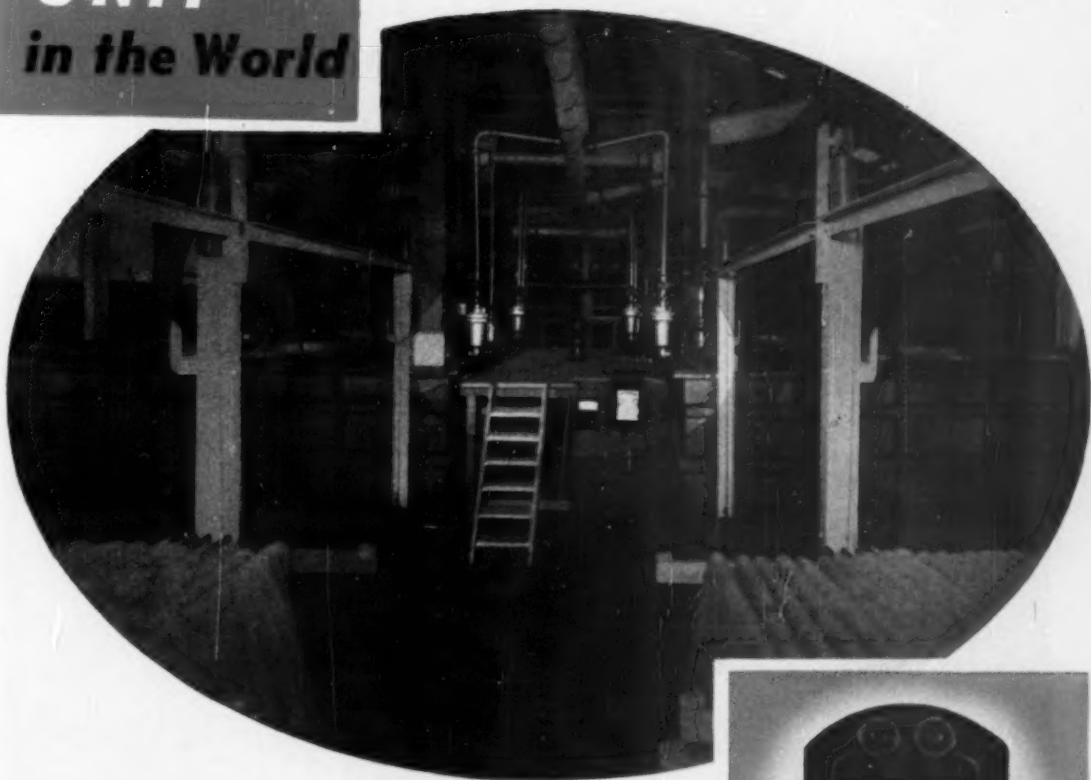
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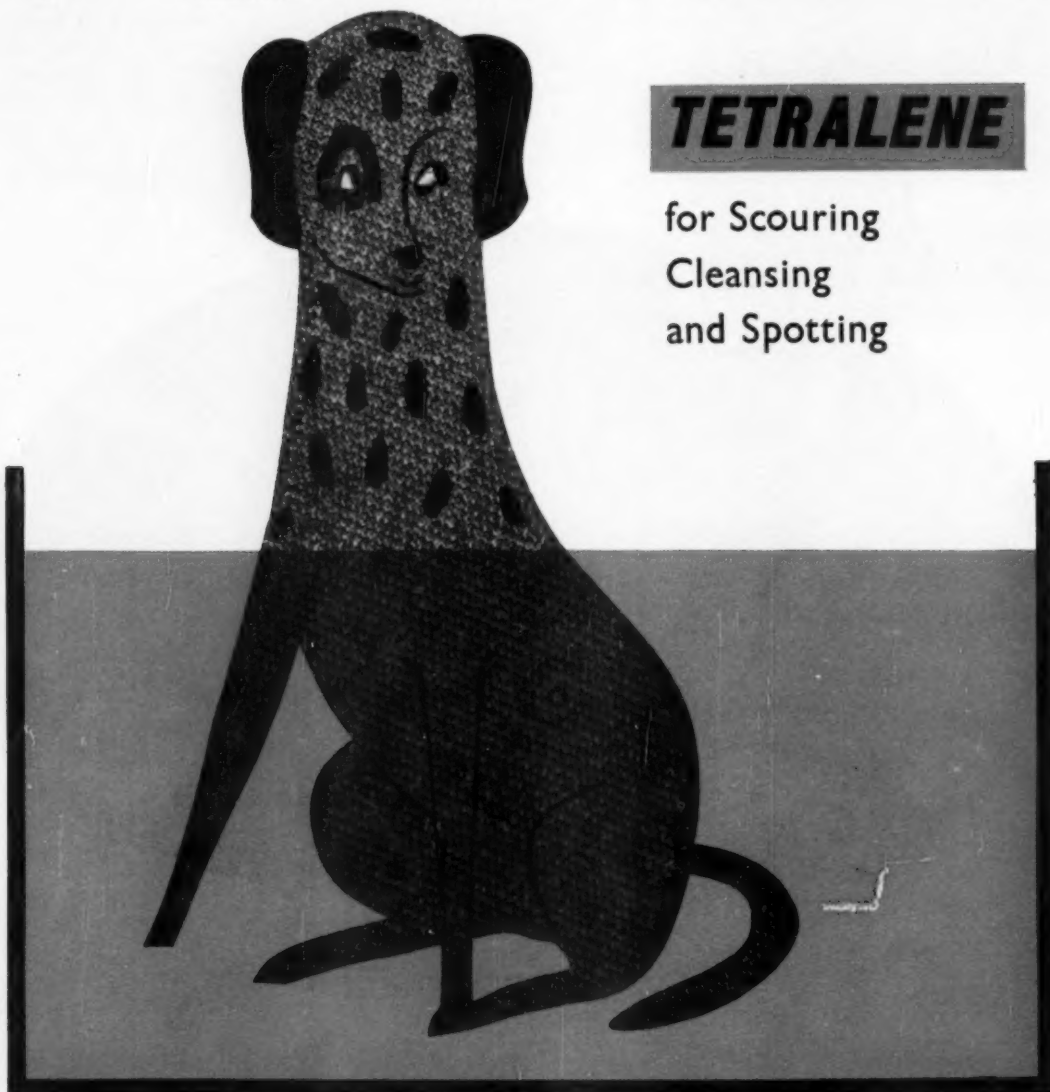
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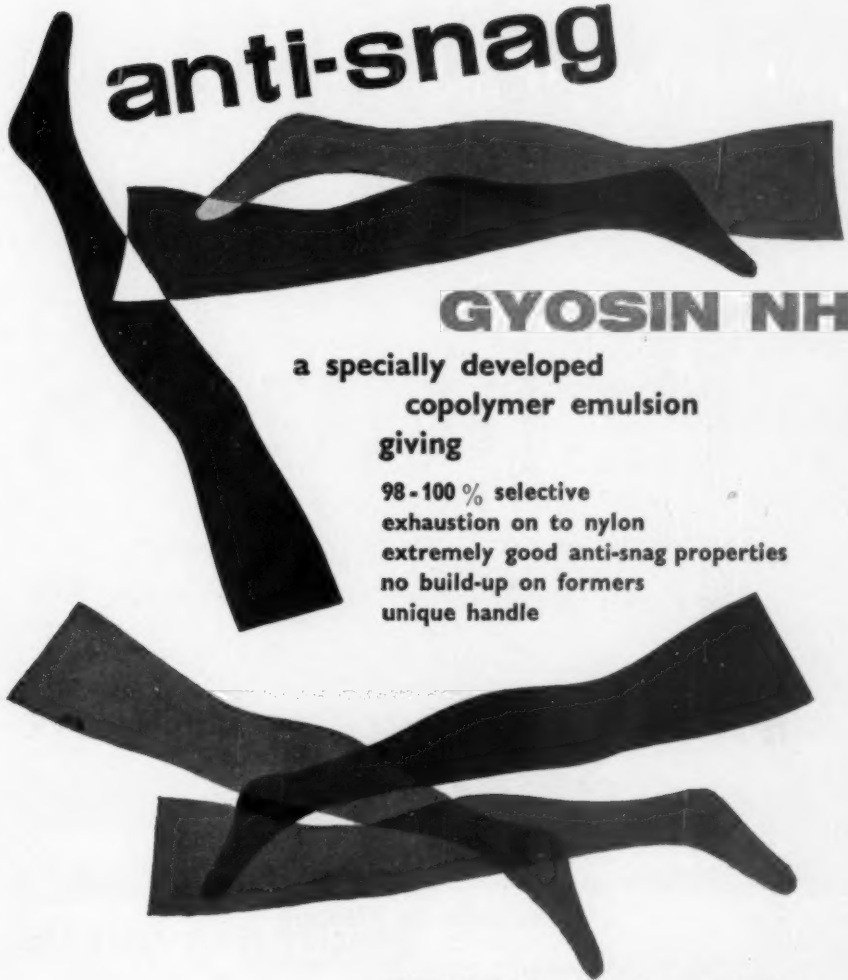
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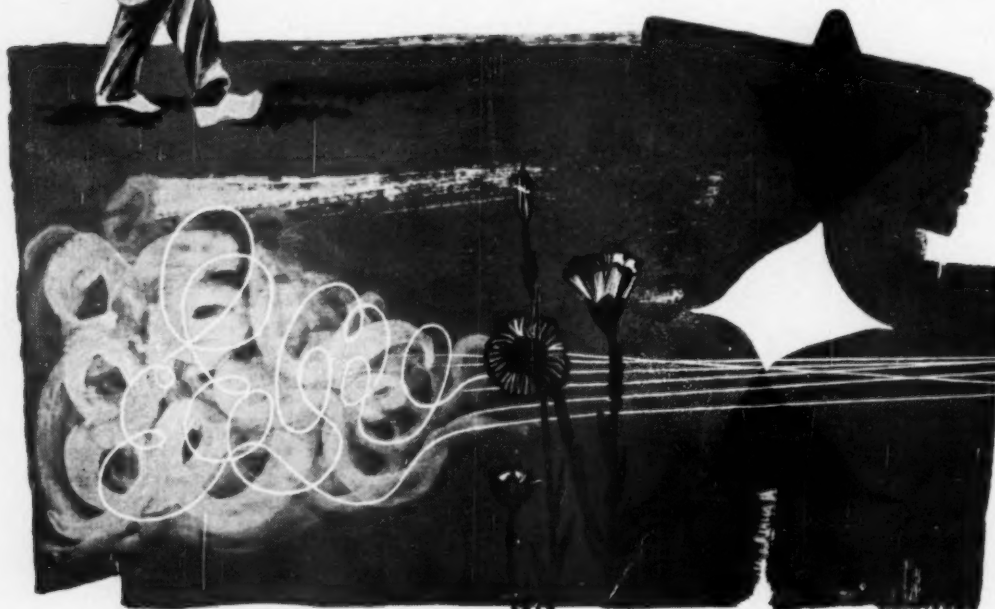
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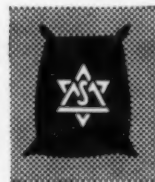
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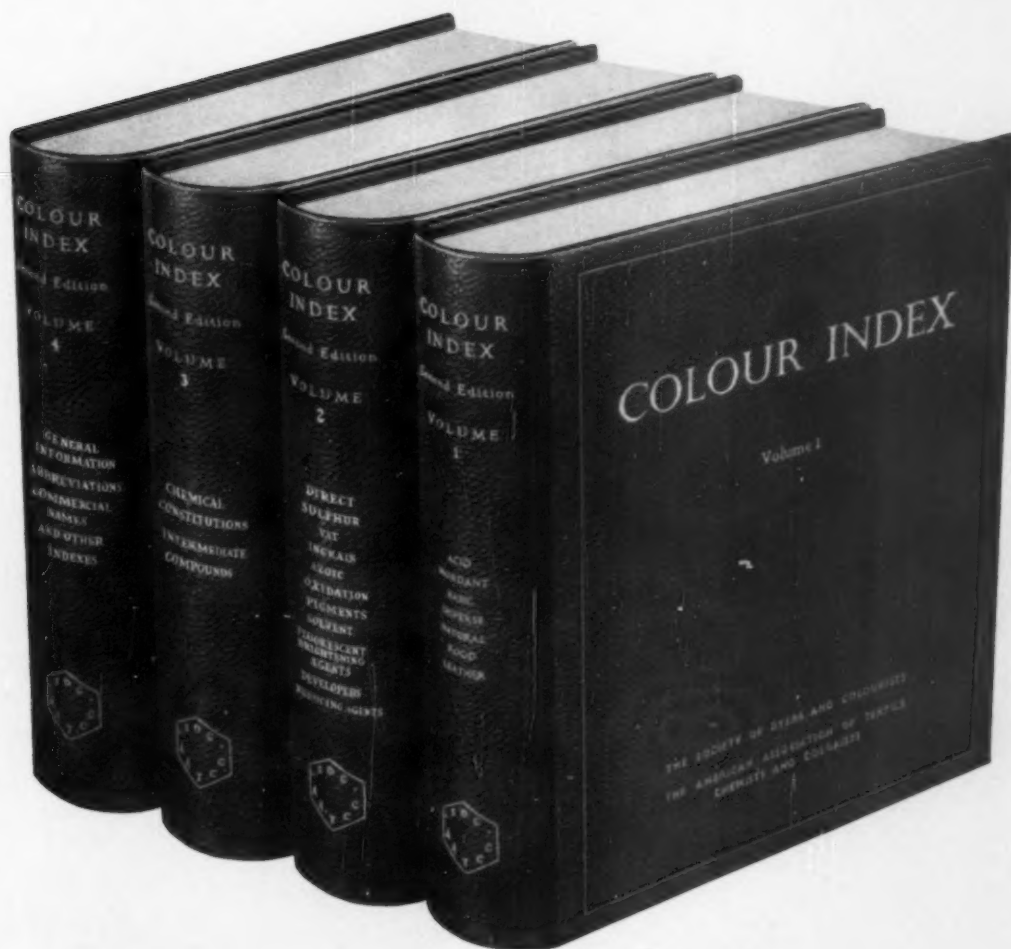
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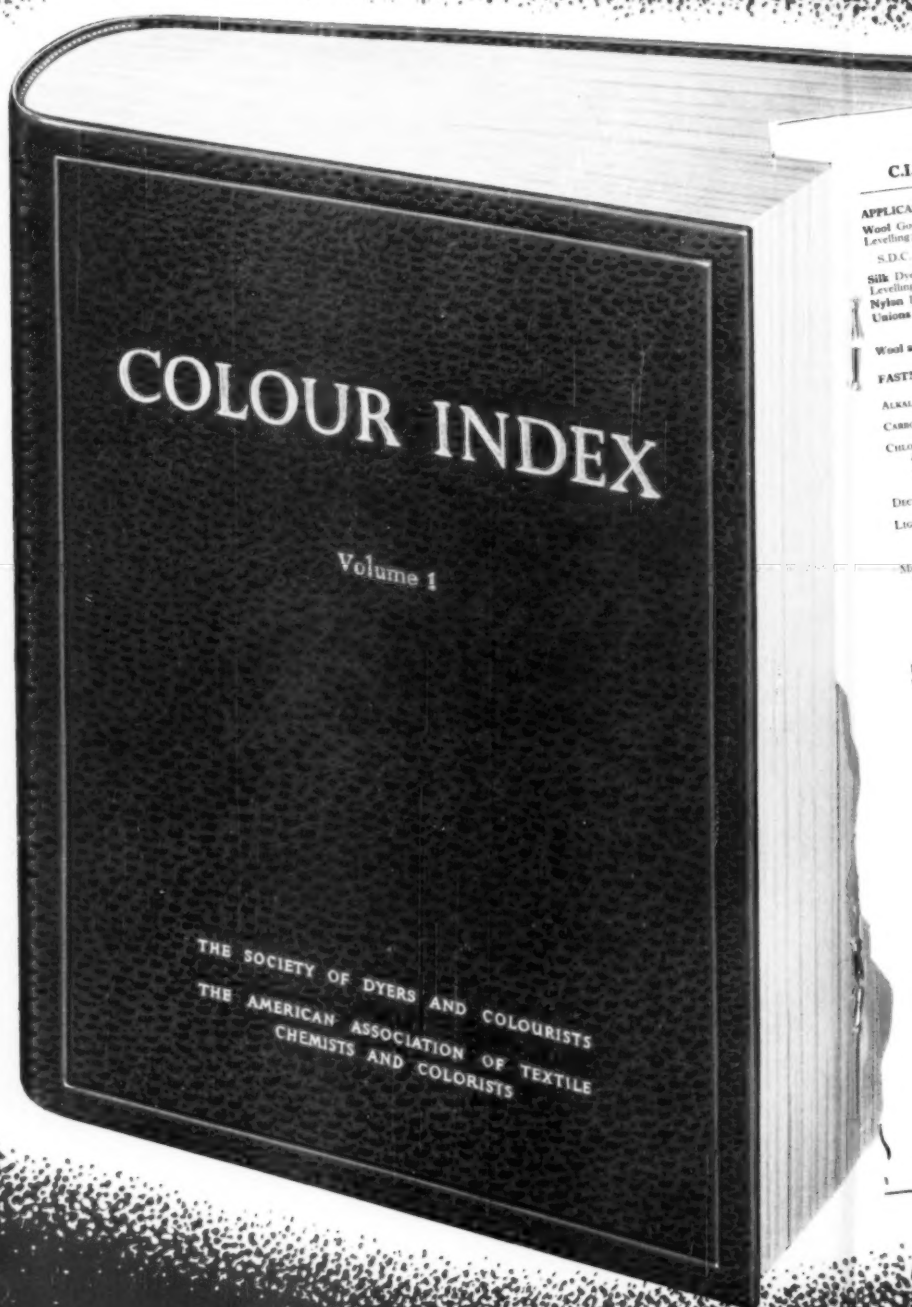
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Leveling: moderate to good

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CARBONISED	5	4-5	4	Alteration (Wool)	1	5	3-4
CHLORINATION	5	4-5	4	Staining (Cotton)	5	5	5
ALTERATION	5	4-5	4	PERMANGANATE	3	4-5	3
Staining (Wool)	5	4-5	4	Alteration (Wool)	3	4-5	3
Staining (Cotton)	5	4-5	4	Staining (Cotton)	3	4-5	3
DECATISING	4-5	4-5	4-5	POTTING	3	4-5	3
ALTERATION	3	3	3	Alteration (Wool)	3	4-5	3
Staining (Wool)	3	3	3	Staining (Cotton)	3	4-5	3
Staining (Cotton)	3	3	3	SEA WATER	3	2-3	2-3
LIGHT	1-1	Normal	4-5	Alteration (Wool)	3	2-3	2-3
2- Normal	5	4-5	4-5	Staining (Cotton)	3	2-3	2-3
MILLING	3	3	3	STOVING	4-5	4-5	4-5
Alteration (Wool)	3	3	3	Alteration (Wool)	4-5	4-5	4-5
Alteration (Cotton)	3	3	3	Staining (Cotton)	4-5	4-5	4-5
Acid	3	3	3	WASHING	4-5	4-5	4-5
Alteration (Wool)	3	3	3	Alteration (Wool)	4-5	4-5	4-5
Staining (Cotton)	3	3	3	Staining (Cotton)	4-5	4-5	4-5
DISCHARGEABILITY	Good	Good	Good				
SOLUBILITY	Water, good	Water, good	Water, good				
EFFECT OF METALS	Copper, somewhat redder: Iron, weaker and duller	Copper, somewhat redder: Iron, weaker and duller	Copper, somewhat redder: Iron, weaker and duller				

TEXTILE USAGE

DYEING

Generally where high tinctorial value is of interest for the production of heavy shades of carpet, brown and olive, in combination with other acid dyes. For dyeing woollen carpet yarns, light weight piece goods and hat felts
Of somewhat limited interest on silk, the fastness to water, sea water, washing, milling and preparation being a little lower than on wool

PRINTING

Dischargeable to a good white on wool and silk
Generally for direct print styles on wool and silk

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Paper For surface staining and colouring of creped tissues
Miscellaneous For colouring milled coals, casein, plastics, anodized aluminium, writing inks and wood stains. For manufacture of light filters in photography
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See Food Yellow 4

C.I. 10315

Nitro

Dyes wool and silk from a weak acid dyebath but rarely used in normal dyeing.
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C.I. Acid Yellow 23

Hue Yellow

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Acid Yellow T	YDC
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Alsen Tartrazine	AAP
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Fast Wool Yellow T	HD
Fosaso Yellow T	JCO
Hidacid Tartrazine	RYK
Hydroxine Yellow L	CAC
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Kion Yellow T	Vond
Kion Yellow TA	NAC
Java Yellow	MDW
Mimui Tartrazine	SAC
Naphthocid Yellow O	KKK
San-ei Tartrazine	KKK
Shows-Kowa Tartrazine	KKK
Segal Tartrazine	LBI
Tartar Yellow FS, N, FF, S	UIC
Tartar Yellow	S
Tartrazine	JWL
Tartrazine AF	Adel
Tartrazine B	BCC, CCC, DdP, FDN, FNC, Fran
Tartrazine C	Gy, Ipea, KO, MVC, NCC, S
Tartrazine J	Vond, WBS
Tartrazine Lake Yellow N	Ciba
Tartrazine M	CCC
Tartrazine N	NAC
Tartrazine NS	G
Tartrazine O	Acma
Tartrazine XXX	ICI
Tartrazol BFC	ICI
Tartrazol Yellow O	NSK
Unitertracid Yellow TE	PH
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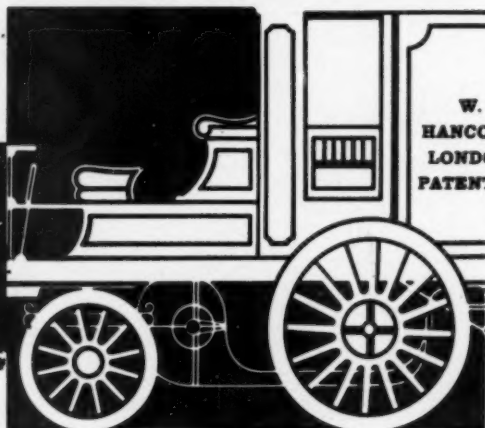
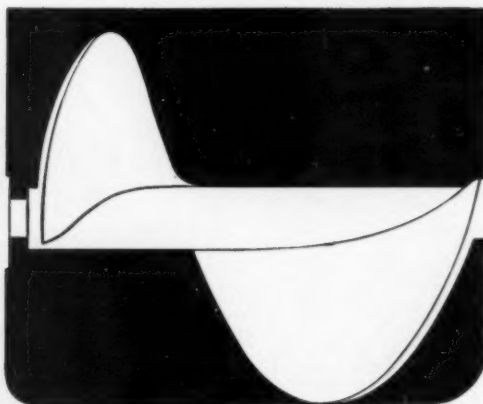
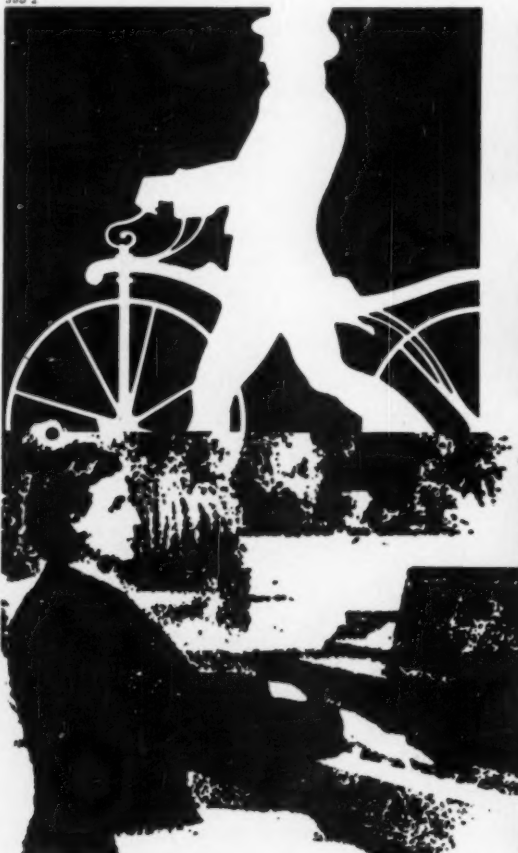
It was the Age of Liberalism in politics, of Romanticism in art. Louis Philippe was King of France. The German States were forming the Customs Union. Belgium had become a national state and the young South American Republics were consolidating their independence from Europe. The Liverpool-Manchester railway was open. Slavery was abolished in the British Empire. Faraday had discovered the basic laws of electrolysis. Runge had isolated aniline from coal tar, and the first photographic moving pictures had been taken. Goethe was not long dead; Stendhal's novels were being read and Chopin's music listened to. Wagner and Verdi were twenty. It was five years since the building of the White House in Washington and the discovery of aluminium, two years since the discovery of the North Magnetic Pole.

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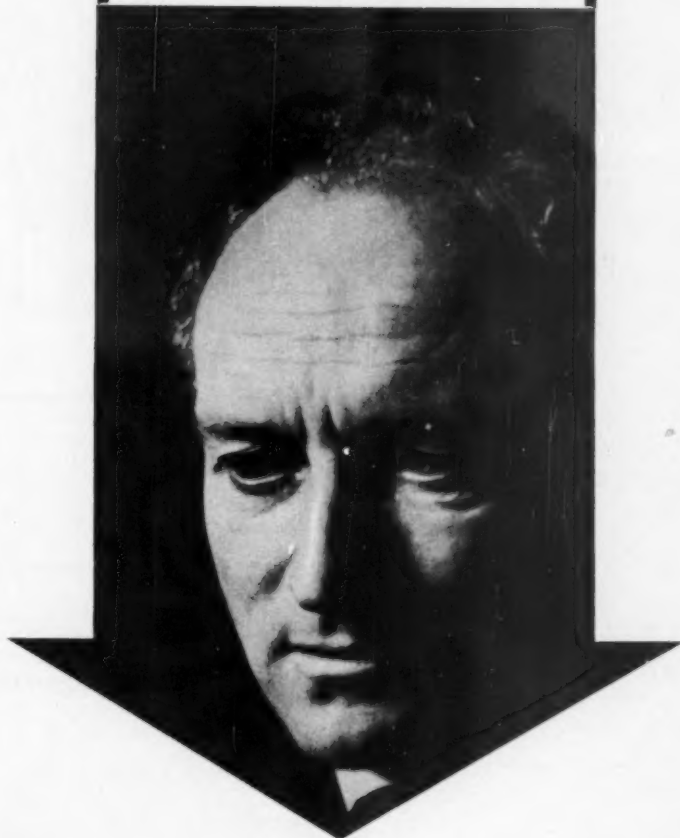
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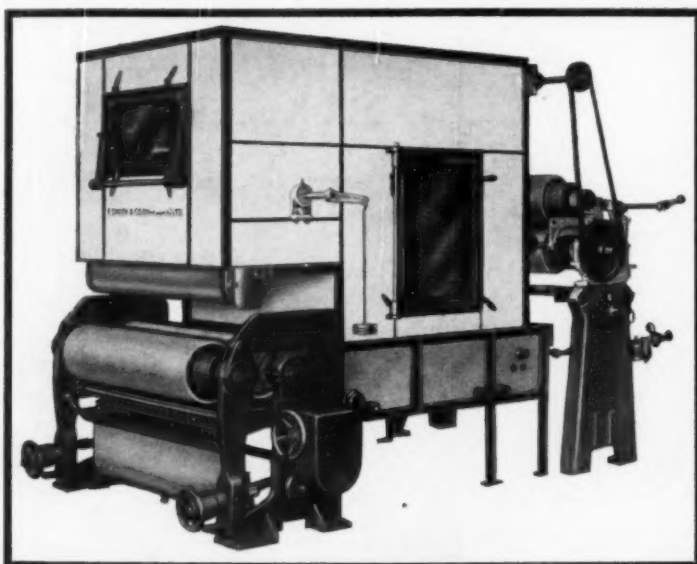
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TABLE V

Bleaching pH	Bursting Strength (lb./sq.in.)	Relative Viscosity in <i>m</i> -Cresol	Reflectance (%)
--------------	--------------------------------	--	-----------------

Unbleached (scoured only) ...	31.4	30.2	74.8
2.5-3.0 ...	25.3	23.8	85.6
4.5 ...	26.3	24.2	87.2
6.0-7.5 ...	26.8	24.8	90.0

The drop in tensile strength after bleaching is fairly small, even with an acid concentration approximately seven times as great as normal, indicating a wide margin for error in practical usage. This is illustrated in Table VI.

TABLE VI

Bleaching Conditions	Breaking Load (g.)	Extension at Break (%)
----------------------	--------------------	------------------------

Control (scoured only) ...	97.9	31.3
3 lb./100 gal., pH 7.0 ...	91.0	27.0
20 lb./100 gal., pH 7.0 ...	85.0	27.3

VISCOSE RAYON AND CELLULOSE ACETATES

The same bleaching formula is used for viscose rayon, secondary cellulose acetate, and cellulose triacetate. The fact that peracetic acid gives its best results at a pH of 6-8 makes it particularly useful for bleaching cellulose acetate. Table VII compares the results obtained in the bleaching of viscose rayon with peracetic acid and with hydrogen peroxide by steeping methods at elevated temperatures and at room temperature. It will be

TABLE VII

(0.5-vol. H_2O_2 with 3.5 g. Na_2SiO_3 + 1.0 g. Na_2CO_3 + 0.3 g. NaOH per litre)

	Temp. (°F.)	Time (hr.)	Reflectance (%)	Fluidity (poise ⁻¹)	Size (%)	Sulphur (%)
Unbleached ...	—	—	74.8	8.5	4.9	0.14
Peracetic acid (3 g./litre) ...	150	1	91.4	9.4	0.5	0.03
Hydrogen peroxide (0.5 vol.) ...	150	1	92.2	9.6	0.2	0.04
Peracetic acid (3 g./litre) ...	Room temp.	12	89.3	8.8	—	0.06
Hydrogen peroxide (0.5 vol.) ...	Room temp.	12	89.8	9.4	—	0.07

noted that the elevated temperature used is lower than in the case of nylon.

The use of either agent effects a satisfactory removal of sizes and starches, simultaneously with bleaching. In addition, the bleach process is effective in removing sulphur and sulphur compounds which have been left behind by the viscose manufacturing process. This removal of sulphur is important in order to prevent the possibility of highly coloured sulphide stains occurring during contact with metal or metal salts. Such stains could subsequently occur during sizing, weaving, knitting, or finishing processes. Viscose rayon may contain up to 0.3% sulphur on the weight of fabric (Nelson system), and this can be effectively reduced to a safe limit of approx. 0.05% by the

above bleaching treatments, which effect removal by virtue of the high temperature used and by sulphur oxidation processes.

COTTON-NYLON BLENDS

Considerable attention is being paid in some sections of the industry to fabrics constructed from cotton-nylon blended yarns. It is worth noting that hydrogen peroxide has a mild bleaching action on pure nylon, but cannot be recommended owing to the fact that degradation of the polymer occurs. In the case of cotton-nylon blends, however, containing up to 25% nylon, hydrogen peroxide proves ideal. It is considered that this is due to the natural stabilising elements present in the grey cotton, which, in some unknown manner, exert a "protective influence" on the nylon. The prior removal of these impurities by high-temperature scouring causes their partial migration into the nylon, and results in an inferior standard of bleach accompanied by increased chemical damage to both nylon and cotton.

The following safe process can be recommended—

1. Desize and quench in the presence of a wetting agent
2. Pad through a solution of 0.5-1.0% peracetic acid to about 100% take-up of liquor and leave overnight at room temperature
3. Wash off and bleach with 1-2-vol. hydrogen peroxide using the standard cotton bleaching method.

WOOL-NYLON BLENDS

Wool-nylon blends can be safely bleached by the conventional wool bleaching method using hydrogen peroxide.

COTTON BLEACHING

Peracetic acid may also be used for bleaching raw cotton, although hydrogen peroxide is preferred on account of its lower cost. In addition, the acid would suffer from the disadvantage that its use under neutral bleaching conditions would dictate a prescour to remove seeds and motes. It can nevertheless be safely used for bleaching cotton fabric partially dyed with azoic and vat dyes, some of which are sensitive to the more widely used bleaching agents.

TABLE VIII

Treatment	Reflectance (%)	Fluidity (poise ⁻¹)	Size Removal (%)	Wettability (sec.)
-----------	-----------------	---------------------------------	------------------	--------------------

Scoured fabric ...	78.0	2.1	95	> 30
Bleached fabric ...	96.5	2.6	100	< 1

The results in Table VIII were obtained on a sample of low-quality American woven fabric after scouring in 1% caustic soda for 4 hr. and bleaching in 5 g. peracetic acid per litre at 180°F. for 2 hr.

Acid Prepadding

Per acids such as peracetic and more especially Caro's acid have a useful rôle in cotton bleaching as prepadding agents, which assist the removal of starches, size, seeds, and notes. The use of an overnight treatment at room temperature is more economical than caustic scouring, and helps to

mixture of peracetic acid and sodium hypochlorite is reasonably successful in this respect, and the degree of shrinkproofing obtained is greater than is given by the use of either chemical separately. A subsequent treatment with hydrogen peroxide and sodium bisulphite improves the whiteness and eliminates the yellow discoloration caused by the shrinkproofing process.

The treatment consists in impregnating with 1.8% peracetic acid plus 1.5% chlorine on the weight of wool at room temperature for 30 min. Table X helps to illustrate the degree of shrinkproofing obtained by the method.

TABLE IX

Treatment	Fluidity (poise ⁻¹)	Ether Extract (%)	Reflectance (%)	Wettability (sec.)	Ash (%)	Size (%)
Grey state	2.5	1.10	53.0	>30	1.55	5.15
Padded in 0.2% soln. of Caro's or peracetic acid ...	2.7	1.45	62.0	>30	0.52	1.42
Peroxide bleach (4 hr.) ...	3.7	0.35	91.2	< 1	0.60	0.40
Soda-ash scald (2 hr.) ...	3.9	0.43	93.3	< 1	0.26	0.48

produce an absorbent, well bleached fabric of low ash content. There is less loss in weight than occurs in an alkaline scouring process, coupled with a lower reduction in width shrinkage. If required, fluorescent brightening agents can be incorporated in the acid bath prior to bleaching. The impregnated cloth is normally squeezed to 100% take-up.

Some of the features of the process are illustrated by the results in Table IX, which are based on an average of 20 types of American, Egyptian, and Indian cotton bleached in 5 different kiers with hydrogen peroxide between 180° and 200°F.

It will be noted that the amount of ether-extractable matter is increased as a result of the per-acid pretreatment.

In many instances, cotton which has been pretreated with a per acid at room temperature can be given hydrophilic properties after bleaching equivalent to material which has been preboiled in caustic soda under pressure. At the same time, the chemical damage after bleaching is lower on the acid-pretreated material.

In view of the modern trend of using an increasing number of blends of natural, regenerated, and synthetic fibres, the established use of peracetic acid as a bleaching agent is a logical consequence, owing to its safe action on all fibres. Bleaching is recommended at 150–180°F. in place of higher temperatures, since chemical damage is kept to a minimum in this range.

It is of incidental interest that peracetic acid is useful for bleaching fibres containing chlorophyll. These include various grasses and bast fibres, coir, ferns, and immortelles.

SHRINK-RESIST PROCESS

One of the more recent uses of peracetic acid is its application in providing a shrink-resist finish on wool¹⁰. This process has now reached the stage of commercial development. A number of shrink-proofing methods have been patented, but not all are successful in leaving the wool with its original characteristic handle unimpaired. The use of a

TABLE X

Treatment	Area Shrinkage (%)	Reflectance (%)
(1) Scoured	21.5	63.0
(2) 2-vol. H ₂ O ₂ steep at 120°F. for 2 hr. ...	13.2	64.5
(3) 2-vol. H ₂ O ₂ steep at 120°F. for 8 hr. ...	11.5	67.5
(4) 2-vol. H ₂ O ₂ steep at 120°F. for 16 hr. ...	9.7	75.0
(5) 1.8% Peracetic acid + 1.5% chlorine (on wt. of wool)	5.5	53.0
(6) As (5), followed by 4-vol. H ₂ O ₂ pad at room temp. for 24 hr. ...	5.5	71.0
(7) As (5), followed by 2-vol. H ₂ O ₂ steep at 120°F. for 16 hr.	3.0	72.0

* * *

The authors wish to thank the Directors of Laporte Chemicals Ltd. for permission to publish this paper, and their colleagues in the laboratory for assistance in its preparation.

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Discussion

MANCHESTER

Mr. P. J. DOLBY: The lecturer mentioned that the action of hydrogen peroxide, particularly in the cold method of bleaching, is not to remove the waxes from the cotton but to bleach them *in situ*. Is cotton prepared in this manner suitable for padding processes at relatively low temperatures, and if so is there a possibility of the fabric losing its absorbency on storage?

Mr. CHESNER: A high degree of absorbency is not necessarily incompatible with a high wax content in the bleached fabric, and providing that such high absorbency has been obtained, padding processes can be safely carried out.

It has been found in the laboratory that the high absorbency of six varieties of cotton fabric ranging from light-weight poplins to medium-weight drills is not substantially affected after 8 months' storage.

Mr. H. W. PARTRIDGE: Would the lecturer recommend the addition of (a) protein, (b) magnesium, to increase the stability of the peroxide bath? If so, what concentrations would he advise?

Mr. CHESNER: Providing that water of at least 2° hardness is used for making up the cotton bleach bath, adequate stabilisation can be obtained without such additions. When soft water or industrial condensate is used, the addition to the bleach bath of 1.5-3.0 oz. magnesium sulphate per 100 gal. water is recommended. The addition of 1½ lb. of a suitable protein per 100 gal. water should be considered only in the presence of copper contamination.

Dr. E. D. TOTMAN: The authors substantiate the claim of previous workers that, when hydrogen peroxide is used as a bleaching agent, the time of afterbleach washing can be considerably reduced as compared with the afterwashing time when hypochlorite is used. Does he also maintain that a sour treatment after hydrogen peroxide bleaching is not necessary? Washing cellulosic materials free from alkali is a difficult process, and only by using a sour or water wash of acid pH (e.g. 5.5-6.5) can the material be washed to neutral pH. Unless the material is washed to a neutral or slightly acid pH, the whiteness of the material will be affected adversely.

Mr. CHESNER: It is difficult to wash cellulose entirely free from alkali, unless an efficient washing machine is used. At the same time, it must be borne in mind that, unlike cotton which has been scoured in caustic soda, material which is bleached in a hydrogen peroxide solution containing a mixture of alkalis has a pH after bleaching in

the region of 9. In practice, such material can frequently be washed to a neutral pH. However, if the efficiency of the washing machine is known to be low, and the fabric is a heavy one with a close weave, then it would certainly prove quicker to resort to a mild sour after bleaching.

Dr. TOTMAN: Have the authors any knowledge of the effect of adding certain substances, e.g. sodium sulphite, to the normal kier liquor?

Mr. CHESNER: The addition of sodium sulphite to the caustic scour in kier boiling is able to give rise to reduced consumption of hydrogen peroxide during the subsequent bleaching stage. It is considered, however, that the greatest economy results by the omission altogether of a separate scouring treatment whenever possible.

Mr. J. W. HEWITT: Souring is necessary in order (a) to remove kier staining if any, and (b) to clean up the goods and act as an antichlor. Would not peroxide processing equally require an after-sour? Does the question of labour cost really affect the issue, as most movement is effected by winches and pumps?

Mr. CHESNER: The likelihood of kier stains occurring in peroxide bleaching is very small, since the walls of the kier are lined with silicate cement. As a result, souring has, in general, been found to be unnecessary. The labour cost per yard of bleached goods represents a smaller fraction of the overall cost in the case of peroxide bleaching than with conventional bleaching methods. This holds true for winches as well as jigs, kiers, and package machines. The actual labour cost per yard of bleached goods is also lower in the case of peroxide bleaching.

Mr. HEWITT: Can you show a graph indicating how the rate of bleaching varies with pH?

Mr. CHESNER: The only pH range which is of practical interest to the cotton bleacher is around 10-11, since in this range the highest degree of removal of colour occurs at the lowest cost.

Dr. W. SHAW: How permanent are the whites obtained by the cold peroxide bleaching process, when steamed for the fixation of prints?

Mr. WOODFORD: The whites obtained by room-temperature bleaching are less fast to steaming than those obtained by high-temperature methods, although the fastness is usually adequate for printing purposes.

Dr. SHAW: Since a greater amount of wax is left in a peroxide-bleached cotton than in one bleached by means of hypochlorite, there is the possibility of this impurity melting and redistributing itself over the fibre surface when exposed to a high temperature. Does this in fact occur, and is there any corresponding change in the absorbency and wettability of the cotton?

Mr. CHESNER: The bleached wax, which is concentrated in the primary wall, begins to melt around 54°C., and, even if it were distributed uniformly, it could only provide a layer of up to five molecules in thickness. It is fairly resistant to removal when repeated extractions are made with organic solvents. So far it has not been discovered to what extent redistribution of waxes takes place

when bleached cotton is exposed to high-temperature conditions such as those found in laundering and hot pressing, but it is considered likely that it occurs only on a micro scale.

After repeated laundering or dry cleaning of cotton, followed by hot pressing, the absorbency tends to improve.

Mr. J. A. CLARKE: In the bleaching of coloured goods with peroxide, the lecturer said that *obviously* one would avoid the use of caustic alkali. Why should this be obvious in view of the presence of a strong oxidising agent?

Mr. WOODFORD: A hydrogen-peroxide bleaching liquor containing free caustic soda tends to promote "marking off" with a number of azoic dyes. The use of caustic soda is unnecessary for producing the relatively mild alkaline bleaching conditions which are dictated by the presence of such dyes, and soda ash is therefore the preferred alkali.

Mr. E. A. KAY: With reference to continuous peroxide bleaching processes, and in particular the J-box method, does the lecturer consider that this is a severe process, especially for the bleaching of coloured goods? What are the main reasons why J-box bleaching has not been developed in this country as it has in other countries, e.g. the United States?

Mr. CHESNER: Bleaching treatments with hydrogen peroxide in a batch, continuous, or semi-continuous manner are considered to be mild in comparison with hypochlorite processes from the standpoint of reduction in mechanical handling, reduced processing time, and less stringent chemical treatment.

In the case of coloured goods, the bleaching formulation is governed by the peroxide sensitivity of the dyes. Many millions of yards of woven goods dyed with vat and azoic dyes have been bleached satisfactorily with hydrogen peroxide in the first J box installed in this country. So far, two J-box plants have been erected in Great Britain. No doubt, other continuous bleaching plants will follow, based on the J-box design or incorporating other more recent designs.

Mr. H. W. BEST-GORDON: Could the lecturer give comparative figures for the quantity of cloth bleached with peroxide and with hypochlorite respectively in the United States and in this country?

Mr. CHESNER: It was estimated that in 1949 8,000 million yards of cloth had been bleached in the United States, of which 7,000 million yards had been bleached with hydrogen peroxide. Recent reports substantiate the wide preference for peroxide. Comparative data for this country are not known.

The Work of a Colourist in a Dyehouse Laboratory

J. T. LYNES

Meeting of the Bradford Junior Branch held at the Institute of Technology, Bradford, on 29th January 1957, Mrs. Kathleen Cope in the chair

Summary of a lecture describing the responsibilities of a dyehouse colourist and the work carried out by a dyehouse laboratory.

The responsibilities of the dyehouse laboratory staff can be classified under the following headings—

1. DYEING ENQUIRIES IN CONNECTION WITH NEW ORDERS

The laboratory must ensure that the customers' shades can be matched in a fastness which will meet not only the ultimate consumer's requirements, but also such processing requirements as desizing, scouring, milling, cross-dyeing, bleaching, pre- and post-boarding, which are often much more severe than any treatment which the consumer is likely to give to the finished article.

A few years ago, when the Utility scheme operated, a large proportion of the continuous-filament viscose rayon used as warp in the case-ment trade was vat-dyed. With these dyes no finishing difficulties were experienced, but in recent years the pre-war use of direct dyes has returned. By careful selection a wide range of colours can be dyed with direct and after-treated direct dyes to meet most consumer requirements, but the finishing of these fabrics must be carefully carried out if bleeding is not to occur.

In order to meet customers' requirements of shade it is often necessary to use dyes of borderline fastness, the only alternatives being to offer either a less desirable shade or a more expensive dye.

Continuous-filament viscose rayon dyeing charges fall into the following main groups—

- (i) Ordinary direct dyes
- (ii) Fast-to-light and/or washing (not guaranteed) direct dyes
- (iii) Vat and azoic dyes.

The first group is subdivided into pale and medium-dark, and whilst having no particular fastness, are suitable for many well established uses. As far as possible, easy-levelling dyes are chosen for lingerie, tie cloths, brace webbings, wire coverings, etc.

In the second category are those shades dyed to a standard of wet fastness which will meet the ISO hand-washing test as laid down in the *Third Report of the Fastness Tests Co-ordinating Committee*. The light fastness will depend upon the shade, but the best available dyes are used. This category

also includes those dyeings which require copper-complex dyes or developed dyes, or resin after-treatments with Fibrofix (Courtaulds), Sandofix (S), Fixanol PN (ICI), etc., in conjunction with copper acetate. Yarn dyed in this category is used for casements, furnishings, dress fabrics, etc.

Vat and azoic dyes give the best all-round fastness, but not all the individual dyes are fast to all requirements, so a knowledge of the end-use of the yarn is necessary. Heavy dyeings can be very expensive to produce, and a surcharge is sometimes necessary.

2. THE SUPPLY OF LABORATORY MATCHINGS TO THE DYEHOUSE

Bulk dyeings in the Courtaulds dyehouse at Droylsden have, for many years, been based on laboratory matchings, and all new orders passed into the works for dyeing are accompanied by a carefully labelled dyeing upon which is tabulated all the necessary information. If the yarn dyer is supplied with a recipe which will repeat in bulk, it must also follow that shorter dyeing times will be obtained. This means that better-quality yarns will be provided to the yarn processor.

A very high proportion of cellulosic yarn is dyed with direct dyes, and nearly all colours should be matched by mixing a maximum of three dyes. In making the selection of dyes to be used, it should be the aim to use dyes with as near as possible the same dyeing properties in order to obtain the best possible results for levelness and matching.

It is not generally realised how wide is the range of dyeing properties of the individual dyes within the A, B, and C categories. Unfortunately, after taking the necessary fastness and colour considerations into account, the number of direct dyes with similar dyeing properties is very small, and it is not usually found possible to select a mixing which completely fulfils all requirements. One usually has to compromise.

The dyeing of yarns which are blends of various fibres is one of the most difficult tasks given to the dyer. Some of the new fibres are extremely difficult to dye in a wide range of colours to a high standard of fastness, and very careful consideration must be given to dye selection in order to avoid prohibitive dye costs.

In the dyeing of blends, the conditions should be such that the dyes for each fibre tend to be exhausted on to the appropriate fibre without adverse effect upon the other fibres.

In the presence of wool, dyeing should not be carried out at a pH higher than 7, whilst in the presence of secondary cellulose acetate the temperature should not exceed 80–85°C.

When carrying out laboratory matchings on Fibro-wool mixtures, it is always advisable to begin by dyeing the Fibro component first to determine how much staining of the wool occurs, so that one can avoid dyeing the wool more heavily than the Fibro, as this gives the yarn a poor appearance.

In the dyeing of blend yarns it is also important to aim not only at matching the overall colour but to see that the two components are dyed to match

under different lighting conditions. This often entails a considerable amount of "juggling" with the available dyes.

Other precautions which must be taken in order to supply the dyer with a recipe which will repeat in bulk are—

- (a) The same yarn as is required for the bulk order should be used
- (b) The laboratory dyeings should be carried out at the same liquor ratio as the bulk work
- (c) The dyeing should be maintained at the same temperature as the bulk dyeing
- (d) The time must be controlled.

These are the only fixed conditions which can easily be maintained in the laboratory. The length of time of laboratory dyeings varies depending upon the fibre and the type of dye. In general, we find it necessary to apply direct dyes for only 30 min., and by careful control of the amount of salt used we aim at obtaining the same degree of exhaustion as could be arrived at in bulk over an average dyeing time.

It is generally found that, owing to the longer dyeing time, the bulk dyeing with direct dyes will usually require less salt than the laboratory dyeing. When preparing laboratory matchings on yarns such as Tricel dyed with disperse dyes, it is found that the laboratory dyeings must be dyed for periods of up to 2 hr. at the top temperature in order to obtain recipes which will repeat under bulk conditions.

It has sometimes been suggested that it is not possible to produce on such a small scale dyeings which when transcribed into bulk practice will give repeatable results. This is not the case, and providing that proper care and attention are paid to these dyeings, excellent repeats can be obtained. Indeed, it is essential that they should, particularly with vat dyes on viscose rayon cakes.

We still use the "pot" method of carrying out laboratory dyeings, with stainless-steel beakers heated on a water bath, the yarn being turned or agitated by means of stainless-steel hooks or rods. Whilst this method gives very good results, the laboratory assistant must be extremely careful to ensure that the temperature of the dyebath and the amount of turning or agitation are constant in order that repeatable dyeings are obtained. Evaporation also plays an important part in these dyeings, and the necessary allowance must be made, for the loss by evaporation is extremely important, the aim being that the liquor ratio of the dyeing should be correct at the end of 30 min.

When vat dyes are applied in an open pot, because of the constant oxidation-reduction cycle which takes place owing to the yarn being turned, it is necessary to make frequent additions of sodium hydrosulphite and caustic soda to the dyebath. This causes some difficulty, as the amounts used are not comparable with bulk procedure, and because of the different conditions of the dyebath accurate repeats were very difficult to obtain. Assistants engaged on this type of work require careful training and considerable practice before they obtain satisfactory results.

There was a real need for a laboratory dyeing machine which would overcome these difficulties, and whilst the idea is not new, those available were not suitable for our purpose. A machine was designed by Mr. W. Armfield of Courtaulds Ltd. Research Laboratory which has already been fully described¹. The machine has been in continuous use for approximately four years with completely satisfactory results, and gives good reproducibility of dyeings. The dyeings are at least as level as those dyed by the conventional hand-turning method.

Originally the machine was primarily developed for dyeing viscose rayon skeins with vat dyes in low liquor ratios, but now it is used with equal success for dyeing almost every textile fibre which may be attached between the stainless-steel hooked rods. The carefully controlled standardised conditions under which the dyeings are carried out make it ideal for use in checking dye deliveries.

3. CHECKING DELIVERIES OF DYES TO ENSURE THAT THEY ARE UP TO STANDARD

In most works this is standard practice to ensure that they are maintaining a standard quality, and for a dyehouse which goes to considerable trouble to supply its supervisors with carefully prepared recipes, either from dyeings carried out in the laboratory or from previous recipes of which the present order is a repeat, the checking of dye deliveries is essential. The check dyeings must be carried out under carefully controlled conditions; and with those dyes which are used in quantity, rather than check the stock against delivery, it is preferable to maintain a standard sample of each dye against which the deliveries are checked. This does not mean that deliveries of dyes are often found to be substandard: in fact, it must be said that over recent years the dye manufacturers have maintained a very high standard, and rarely is there cause for complaint. Nevertheless, the time involved in carrying out this work is not large, and if an off-standard delivery is received, considerable trouble is experienced in the dyehouse before the cause is located.

4. FASTNESS TESTING AND QUALITY CONTROL

All recipes for matching should meet the fastness and processing requirements of the customer, and it is necessary for a representative sample from the bulk dyeing to be sent into the laboratory for checking purposes. The difficulty lies in interpretation of the results, not with a dyeing which is perfectly fast but generally with one which shows some slight staining or change in hue. Here, if one has a knowledge of the end-use or processing requirements it helps considerably in making the decision whether to pass or to fail.

The standard of levelness of the bulk dyeing has also to be checked. On loose stock or slubbing a visual examination is usually all that is necessary; and levelness is not so critical, for the yarn is blended prior to spinning. On dyed viscose rayon packages which are possibly to be used for a highly critical trade such as damasks or any plain-type fabric, it is essential that the dyed yarn be examined prior to despatch. The standard of

levelness of each individual dyeing set is determined by removing yarn from the outside, the middle, and the inside of the dyed package or packages which are representative of the bulk dyeing, winding the yarn on to a cone, and knitting into adjacent panels, the yarn from the outside of the package being knitted next to the yarn from the inside of the dyed package. This is a very severe test, and is designed to show up the slightest unlevelness within the package.

It does not follow that, if the bulk dyeing is not perfectly level, it will not be satisfactory for the end-use for which it is required, and each knitting should be examined in conjunction with the knowledge of its end-use. For example, yarn to be used for an end-and-end warp, narrow stripes, or patterns on woven labels generally do not require a very high standard of levelness. This does not mean that one does not endeavour to attain a high standard of levelness for such classes of work, but it does serve as a yardstick when deciding whether a bulk dyeing is good enough.

5. THE DYEING OF SAMPLE LOTS AND INVESTIGATIONS INTO DIFFICULTIES ENCOUNTERED IN BULK PRACTICE

No dyehouse is complete without small-scale machine facilities for providing customers with dyed samples over the whole field of work in which the dyehouse is engaged. These samples should be provided in as near as possible the same quality as subsequent bulk work will be required.

There are many day-to-day problems which can be solved and new dye mixings which require to be tried out in these machines. Dyes which appear to meet all the necessary requirements when tested on skeins in the laboratory are not always successful when used in bulk, and small-scale trials will give a good indication of the results to be expected from bulk dyeings.

The laboratory is the ideal place for these machines, where they do not interfere with bulk production and, as the laboratory is looked upon as an ideal training ground for potential works supervisors, where they can obtain a knowledge of the tools at their command, the dyeing of samples can be an important stage in their training.

The dyer requires a knowledge of the dyeing properties of the dyes under his own conditions. It has been suggested, for instance, that class C direct dyes should be applied by temperature control in order to obtain level results, but in package dyeing, only in rare instances with the highly sensitive poorly migrating dyes in this category have we found improved results to be obtained by using temperature control. The lower liquor flow through the package which is obtained at low temperature more than counterbalances any reduction in speed of dye exhaustion.

6. EXAMINATION OF NEW PRODUCTS

The manufacturers of dyes and auxiliaries for use in the dyeing trade are continually bringing out new products. Information regarding these is circulated in a never ending stream of literature, which would require a large team of people to examine fully. Nevertheless, we must keep a

vigilant eye open in case one of these products shows some advantage over a product which we are at present using. The new product may show some advantage in respect of fastness, dyeing property, colour, or, very important, it may give a required colour more economically than the present mixing. A direct dye, for instance, which owing to its poor levelling properties may not be suitable for dyeing viscose rayon cakes, may be of considerable interest for the dyeing of stock-dyed Fibro; here, because of the method of dyeing and the fact that the fibres will be blended, the standard of levelness is not so critical, and for this type of

trade, dyes of high tinctorial value generally are desirable. To take another example, Tricel, which is a heat-setting fibre, often requires to be dyed with disperse dyes which do not sublime on pleating, whereas secondary cellulose acetate does not need to meet this requirement.

COURTAULDS LTD.
DROYLSDEN
MANCHESTER

(MS. received 22nd November 1957)

Reference

¹ Armfield, W., *J.S.D.C.*, 70, 184 (1954).

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

Defective Wool produced by Sheep-dips

A few months ago some pieces of worsted fabric in the grey state were examined in an endeavour to ascertain the reason for their failure to dye in a level manner. It was found, on treatment with hydrochloric acid of concentration greater than normal, that portions of the fabric assumed a pink coloration. The extent of the coloration varied from isolated fibres to lengths of up to 3 in. of the weft yarn. On treatment with ammonia solution, the pink changed to pale yellow, which was still visible in the cloth, although when dry it could not be detected. It was felt that, apart from being able to produce the effect in the weft yarn from which the fabric was woven, no useful purpose would be served in pursuing the investigation, as the origin of the wool used could not be ascertained. Explanations such as the presence in the yarn of wool containing identification tints came to mind.

Recently, however, a request was received to examine a sample of English wool, representative of a batch running into thousands of pounds, which appeared normal in the fleece, but which, on scouring under the usual mill conditions employing soda ash, developed a golden-yellow coloration to the extent of approx. 4 in. from the tip ends. The colour could not be changed with acetic acid, but turned magenta in *N*.hydrochloric acid. The extreme tips did not produce the colour change. The location of the defective wool suggested that dipping was the most probable cause of the trouble, and therefore the blooms and dips available in the area that produced the defective wool were obtained. Apart from the more modern insecticides, such as Dieldrin (Shell) and Gammexane (ICI), with one exception these products all possessed a very strong phenolic odour. The properties of the dips are given in Table I.

TABLE I

Wash	Type	Colour in <i>N</i> -HCl	Colour in <i>N</i> -NH ₄ OH	Phenol
1	Bloom	Magenta	Orange	+
2	Bloom	Orange	Pale yellow	+
3	Non-bloom	None	None	+
4	Bloom	Orange	Red	—
5	Non-bloom	None	Pale fawn	+

Bloom No. 1 produced colour changes in acid and alkali identical with those of the defective

fleeces. Further, the colour change could not be brought about by acetic acid, leaving little doubt that Bloom No. 1 was the cause of the defect. It appears probable that similar wool was present in the cloth originally examined, but the complete history of this material was not available, so that the position is more obscure.

Although these blooms are usually alleged to weather or scour out, Peters and Stevens¹ have described how the rate of uptake of dyes by wool may be accelerated by the addition of sparingly soluble organic solvents to the dyebath, phenols being particularly effective. The fastness of the dye is identical to that produced when the material is dyed by conventional means. There is no reason why, if Dip No. 1, which is a summer bloom, be applied before a period of warm dry weather, the presence of the phenol, together with the surface temperature of the wool, will not produce effective dyeing conditions. In point of fact, wool rapidly took up dye from an aqueous solution of Dip No. 1 at 50°C. without the presence of acid, and after scouring showed the expected colour change in *N*.hydrochloric acid.

No complaints respecting the use of Bloom No. 4, which is intensely coloured in alkali but is devoid of phenols, have been received, although this may be fortuitous, and due to its lack of use or the season of its application.

I wish to thank my colleague, Mr. F. Farnell, for his advice on some of the practical aspects of this problem.

C. EARLAND

DEPARTMENT OF TEXTILE INDUSTRIES
INSTITUTE OF TECHNOLOGY
BRADFORD 7
YORKSHIRE

29th March 1958

¹ Stevens, C. B., and Peters, L., *J.S.D.C.*, 72, 100 (1956).

The Grain-tree

With reference to your explanation of the symbolism of the above¹ you refer to alips of the grain-tree. The grain-tree is also incorporated in the coat of arms of the Worshipful Company of Dyers and has not infrequently led to speculation as to its exact botanical description.

According to the *Shorter Oxford Dictionary* it may be either cochineal (*Coccus cacti*), which has been

known since 1586 as of Mexican origin, or kermes (*Coccus ulicis*), first referred to in 1598. The dyestuff was formerly supposed to be a berry, but it is actually the pregnant female of the insect found on the tree bark. The kermes or evergreen oak (*Quercus coccifera*) was plentiful in South Europe and Africa.

The coat of arms was granted to the Worshipful Company of Dyers circa 1420-1450, so it may well have been believed at that time that the dye came from berries and not from insects. It is hardly likely that the cochineal grains would be known in this country at that period. There are several reproductions of the Dyers' Company's

coat of arms in existence, notably the one in stone on the almshouses at Crawley in Surrey. This was removed from the older almshouses at Islington and possesses red berries intertwined with the grain-tree slips. These red berries could be attributed to the heraldic licence of the fifteenth century, and all things considered, we can take it that the grain-tree is the kermes oak.

J. BLAIR

OZALID CO. LTD.
62 LONDON WALL
LONDON E.C.2

13th May 1958

¹ J.S.D.C., 74, 304 (April 1958).

ERRATUM

The History and Development of Compressive Shrinkage. F. V. Davis (J.S.D.C., 74, 11 (Jan. 1958))—In the last paragraph of the second column, the thickness of the belt should be either $2\frac{1}{8}$ or $2\frac{1}{4}$ in.

Notes

Meetings of Council and Committees June

- Council—4th
- Finance and General Purposes—18th
- Publications—17th
- Terms and Definitions—12th
- Review of Textile Progress—2nd
- Mercer Lecture—4th
- Burnt-gas Fumes Fastness Subcommittee—3rd.

Deaths

We regret to report the loss by death of Miss M. H. Barnett and Mr. W. L. Scott.

Griess Centenary Symposium

The Society intends to hold a one-day symposium in the Great Hall of the Manchester College of Science and Technology on Friday, 26th September 1958, commencing at 9.30 a.m. The object of this symposium, entitled *The Diazo Reaction Today*, is to commemorate the centenary of the discovery of the diazo reaction by Peter Griess. The following papers are to be presented—

- The Life and Times of Peter Griess*
W. H. Cliffe, Esq. (ICI Dyestuffs Division, Blackley, Manchester)
- The Mechanism of the Diazotisation Reaction*
Dr. J. M. Ridd (University College, London)
- The Mechanism of the Coupling Process*
Professor W. Bradley (University of Leeds)
- The Rates of Reduction of Substituted Azo Compounds*
Dr. W. C. J. Ross and Dr. G. P. Warwick (Chester Beatty Research Institute)
- The Diazo Reaction in Dyeing*
H. R. Hadfield, Esq., and W. F. Liquorice, Esq. (ICI Dyestuffs Division, Blackley, Manchester).

London Section Badge

As mentioned on p. 547, it has been decided that the Chairman of the London Section shall have a

badge of office, and the badge will be presented to the Chairman by the President of the Society on Friday, 7th November 1958.

Annual Meeting of Section Officers

The Annual Meeting of Chairmen and Honorary Secretaries of Sections was held at the Central Hotel, Glasgow, on Friday, 25th April 1958, under the chairmanship of Mr. L. M. Wood (Honorary Secretary of the Society). Among the topics discussed were the use of projectors and tape recording machines, publicity, the list of members, and the publication of lectures.

Annual Golf Competition

The Goodall Trophy Golf Competition took place at Leek on Sunday, 18th May 1958, in rather poor weather. There were 28 entrants, and the winners were—(1) G. V. Kendell (76 - 4 = 72), who also took Mr. A. N. Russell's prize for the best gross score; (2) G. C. Woodford (96 - 23 = 73), who won Mr. T. F. Wardle's prize; and (3) C. W. Green (93 - 19 = 74), who won Dr. P. W. Smith's prize.

Reports of the Sections for 1957-1958

Huddersfield Section

Once again we have to report a successful session. Seven lectures have been held, all of which have been of high standard.

As in past years, we have had two joint meetings, one with the Royal Institute of Chemistry (Huddersfield Section) and the other with the Huddersfield Textile Society. For the former we had two of our own members, Mr. F. Jordinson and Mr. T. Minshall, who gave an excellent talk on *Tests for Colour Vision*. On Friday, November 15th, we held our Annual Dinner at the Princess Café. We had a record attendance, and were

privileged to have the then President-elect, Mr. John Boulton, with us on that occasion, together with our usual guests from Bradford.

We have had only one visit this session. Forty of us were privileged to see the work of the ICI Fibres Division at Harrogate, and were all very much impressed. We have two more visits planned, and one, to the Calder Hall atomic energy plant, is to take place during the summer months.

Our thanks are due to the Chairman and Members of the Committee, for, without their help, we should not have had the successful session we have had.

HORACE TURNER
Honorary Secretary
Huddersfield Section

LONDON SECTION

The lecture programme for the session has consisted of seven meetings in London and one in Luton, in addition to the Fifth London Lecture. Two meetings were held jointly with the Textile Institute, one with the Clothing Institute, and one with the Oil and Colour Chemists' Association. Attendances at all meetings were very good. The lecture on *Colour in Writing and Copying* was noteworthy for the large number of visitors present. We were again privileged to have the use of the rooms of the Royal Society for the lecture meetings.

The Fifth London Lecture, given by Miss Anne M. Buck, Keeper of the Gallery of English Costume, Manchester, on the subject *The Art of Costume*, proved very popular and about three hundred members and visitors attended. The dinner following the lecture was also well supported.

The Annual Dinner and Dance held at the Waldorf Hotel, London, on Friday, January 17th, was a successful feature of the session.

The Section was honoured to have the then President of the Society and Mrs. Paine as their guests at both the Fifth London Lecture and the Annual Dinner and Dance.

Following the appeal last year for a special effort in recruitment of new members it is very pleasing to report a big improvement this session, and the membership now stands at 225 including 5 junior members, an increase of over 10% on the year. Further effort is requested in order that this rate of increase can be maintained.

The Section has decided that the Chairman should be provided with a badge of office to wear at Section meetings and on other appropriate occasions. It is intended that this should be available for the commencement of the next session.

The final event of the year was the Annual General Meeting and Dinner, at which we were pleased to welcome Mr. John Boulton, the newly elected President, and Mr. C. W. Cruickshank, Honorary Secretary and Treasurer of the West Australian Section of the Society of Dyers and Colourists of Australia.

H. W. TAYLOR
Honorary Secretary
London Section

MANCHESTER SECTION

During the past session, seven meetings of the Section have been held in Manchester. The attendance figures show a slight increase over previous years, with a particularly good response to the Ladies Evening and the Symposium devoted to *New Information on Finishing Processes*.

The success of the Ladies Evening was primarily due to the invaluable co-operation of the Officers of the North Western Section of the Clothing Institute in providing the speakers and organising the Fashion Parade—a highlight of this particular function.

It is a great pleasure to record the flourishing state of the Junior Branch. This revival is a tribute to the efforts of the Junior Branch Officers with their re-organisation scheme and the assistance rendered by the Textile Chemistry Department and authorities of the Manchester College of Science and Technology.

The Annual Dinner and Dance was held in the Grand Hotel, Manchester, on Saturday, 1st February 1958. This social occasion was enjoyed by 270 members and guests.

It is with regret that we record the loss by death of the following members of the Section—Messrs. S. G. Corbishley, G. E. Knowles, W. N. Lepine, and J. H. Nuttall. The congratulations of the Section are due to Mr. L. Dennis on the completion of 50 years as a Member of the Society.

The Section Committee has met on five occasions during the past year. At the Annual General Meeting, Mr. A. S. Fern was re-elected to the Committee for a further period of duty and we were pleased to welcome the election of Mr. A. K. Taylor.

K. MELDRUM
Honorary Secretary
Manchester Section

MIDLANDS SECTION

During the session under review, nine lecture meetings were held (three at Loughborough, two each at Leicester and Nottingham, a joint meeting with the British Association of Chemists at Derby, and a joint meeting with the Textile Institute at Kidderminster). A wide variety of topics met with general acceptance, and all the meetings were very well supported: attendances passed the hundred mark on many occasions. On the social side, record numbers patronised the Dinner Dance in October and the Section Dinner in March. On both occasions we were honoured by the presence of officers of the Society, and the pleasant atmosphere emphasised the excellent spirit which exists in the Section. Membership shows a small net increase (13), new members being somewhat offset by removals from the district.

Mr. A. W. Carpenter continues in the chair for a second year. Mr. C. A. Mills now retires from the Vice-chairmanship, his place being taken by Mr. Alan Chuley, a popular choice as Chairman-elect. We regret to report the resignation from the Committee of Mr. R. Fernaby, who feels that after fifteen years' service his place should go to a younger member. An even more severe loss is

incurred by the death of Mr. H. C. Olpin. His many services to the Society in general and the Midlands Section in particular have been recorded elsewhere in the *Journal* (74, 484 (June 1958)). At a well attended Annual General Meeting, Messrs. T. E. Charlesworth, W. L. Langton, C. A. Mills, and J. Saunders were re-elected to the Committee, to which we are also now happy to welcome Mr. B. B. Brewer, Dr. W. L. Lead, and Mr. L. Telesz.

The officers of the Section extend their thanks to all members of the Committee for their enthusiastic service, also to those members of the Section who work on standing committees of the Society and upon Council. The Section, at rather short notice, has accepted responsibility for organising this year's Summer School at Nottingham University in August, and we record with great pleasure the almost instantaneous response by talented members of all Sections of the Society with offers of help.

We also wish to congratulate our new Honorary Secretary, Mr. John Rayment, on a very successful first year of office.

A. W. CARPENTER
Chairman
Midlands Section

NORTHERN IRELAND SECTION

There is nothing, apart from routine activities, to report on the session just ended.

Seven technical meetings were held in Belfast, one of these being shared by the local section of the Textile Institute. We shared one of the Textile Institute lectures.

Six committee meetings were held during the session.

The golf tournament was held at Portadown Golf Club in June 1957, and it was well attended by members and their friends.

Our annual Dinner Dance was held in October 1957 at Woodbourne House Hotel. There was an attendance of 170 members and their friends.

The Annual General Meeting and Dinner was held on 22nd March 1958. We had the privilege of having as guests at our Dinner Dance, Mr. E. B. Jones, Permanent Secretary to the Ministry of Commerce for Northern Ireland, Dr. H. W. Ellis of the London Section, and Mr. J. W. Nicholls, General Secretary of the Society.

A prize of five guineas was put up by this Section to be awarded to the student considered to have made most progress during the session ending June 1958 in the bleaching, dyeing, and finishing course at the Belfast Technical College.

JAMES PORTER
Honorary Secretary
Northern Ireland Section

SCOTTISH SECTION

We are pleased to report the conclusion of a successful and interesting session, during the course of which eight lecture meetings were held, seven in Glasgow and one in Galashiels. In addition, we held our usual joint meeting with the local section of the Textile Institute.

Sectional membership shows the biggest increase for some considerable time—we enrolled twenty new members and gained ten from transfers from

other Sections. Against these figures, three of our members moved to other areas, resulting in a net increase of twenty-seven, which is considered to be very encouraging.

Unfortunately the Sectional Dance did not receive the support that was anticipated, and the Committee have decided, with reluctance, not to recommend a similar function for the 1958-1959 session.

The annual Golf Outing was again well supported, and, despite adverse weather, enjoyed by all.

We are extremely grateful to Council for choosing Glasgow as the venue for the Society's Annual Dinner, particularly as this marks the Golden Jubilee of the Scottish Section.

In conclusion, appreciation must be expressed to our Chairman, Mr. W. G. B. Grant, and all members of the Committee, without whose help the session could not have been so successful.

F. ATTACK
Honorary Secretary
Scottish Section

WEST RIDING SECTION

Under the Chairmanship of Mr. G. E. Styan the Section has held eight lecture meetings and a discussion on *Fluorescent Brightening Agents*. The theme of the lectures was the application of dyes and their behaviour in the dyeing process on wool and the newer fibres. The two lectures held in Leeds were chosen so that they would be of interest to a greater number of members, with a view to attracting a bigger attendance. The change in policy was justified, there being 120 members present at Dr. J. F. Gaunt's lecture and 85 at that of Dr. O. Glenz. The average attendance at meetings was 86, which is an improvement on former years.

The Supper and Smoker and the Ladies' Evening were again successful social events.

The prize money given by the Dyers' and Finishers' Association for the West Riding Junior Members' Competition for the 1956-1957 Session was divided and awarded to Mr. G. Tabborn of Leeds University and Mr. B. Bennett and Mr. R. Lawson of Bradford Institute of Technology. The number of entries was again disappointing. The form of the Competition for the 1957-1958 Session was changed in the hopes of getting more entries, and it is hoped to decide on the prize winners at our next Committee Meeting, to be held on April 17th.

The Section Committee has met on four occasions.

ESMÉE SMITH
Honorary Secretary
West Riding Section

BRADFORD JUNIOR BRANCH

During the last year nine meetings have been held at the Bradford Institute of Technology and the average attendance was forty. A visit was paid to Courtaulds Research Laboratories at Manchester in May 1957, and the Annual Dance was held at Fountain Hall, Bradford, in February 1958.

This year the Bradford Junior Branch celebrates its Diamond Jubilee, the Inaugural Meeting having been held on Tuesday, 15th March 1898. It is hoped that later this year a special meeting

or function may be arranged to mark this anniversary.

KATHLEEN COPE
Honorary Secretary
Bradford Junior Branch

LEEDS JUNIOR BRANCH

The branch has held four meetings this session; another, which was to have been addressed by Miss E. Smith, had to be cancelled because of bad weather. Two visits were made, one to The Clayton Aniline Co. Ltd., Manchester, and one to Messrs. Alf. Cooke Ltd., Colour Printers, Leeds. Both were well attended and proved most interesting.

Dr. C. B. Stevens, who has been chairman for several years, resigned during this session in favour of a student chairman, and it is now intended that the Branch be run entirely by Junior Members.

JOAN M. FIRTH
Honorary Secretary
Leeds Junior Branch

MANCHESTER JUNIOR BRANCH

This session the policy was altered with the objects of avoiding the preponderance of senior members which has been a feature of Junior Branch Meetings in recent years and of encouraging the establishment of an active Junior Branch. Lectures have been held at 4.30 p.m. instead of in the evenings, for the maximum convenience of both day and evening students, and, to all firms in the area likely to have potential members in their employ, a circular letter was sent detailing the lecture programme and appealing for their co-operation in allowing staff to attend. The response to this letter seems to have been very good indeed, and our thanks are due to the firms concerned.

A most interesting series of lectures has been delivered to an average attendance of 57, very few indeed of whom have been outside the Junior Member and student age groups.

A Committee has now been formed which has the tasks of—(a) drawing up a proposed constitution for the Branch; (b) arranging a programme of

lectures and, if possible, two works visits for next winter.

No actual figures are yet available, but it is evident that the increased activity of the Branch has already resulted in a marked increase in the number of applications for Junior and Student Membership of the Society.

The Branch wishes to record its gratitude to the lecturers, viz. Dr. H. A. Thomas and Messrs. C. Garrett, F. Wood, H. R. Hadfield, E. Moss, and J. R. Whinfield.

W. R. LEIGH
Honorary Secretary
Manchester Junior Branch

SCOTTISH JUNIOR BRANCH

As there was no Annual General Meeting in the session ended March 1957, this report covers both the session ended March 1957 and the current session ended 12th March 1958.

At the Inaugural Meeting of the Scottish Junior Branch, held in Paisley Technical College on 24th January 1957, seventeen applications for membership were made. There were also at that meeting several students who were already members of the Scottish Section but who were under 25 years of age and were therefore eligible to join the Junior Branch. The membership at the moment stands at 38 members. This number includes those students who were already members of the Scottish Section when the Junior Branch was formed.

Two scientific meetings were held in the session ended March 1957, and six scientific meetings, including the meeting following the A.G.M., were held in the current session. One of the meetings was held jointly with the Scottish Section of the Textile Institute. All these meetings were held in the Paisley Technical College, and the average attendance was twenty-five.

One works visit was made at the end of the 1957 session to the Seedhill Finishing Co., Paisley. Enquiries have been made by the Committee for similar works visits at the end of the current session but with no success.

R. McDONALD
Honorary Secretary
Scottish Junior Branch

New Books and Publications

Encyclopedia of Chemical Technology **First Supplement Volume**

Edited by R. E. Kirk and D. F. Othmer. Pp. viii + 974. New York and London: Interscience Publishers. 1957. Price, \$25.00 (175s. 0d.).

Since the publication of the fifteen volumes of the *Encyclopedia of Chemical Technology* (cf. J.S.D.C., 64, 190 (1948)) the advances made in some of the subjects included therein and the appearance on the scene of others, relatively unknown or completely new, have necessitated the compilation of the present volume in the unending task of keeping the work up to date, or as little behind

actuality as practicable. Apart from this highly necessary and commendable purpose, however, the supplementary volume also serves to emphasise the pace of the advances in many spheres of industrial science. The editors have wisely decided not to issue a supplement consisting of additions and corrections to the encyclopaedia but to rewrite completely those topics in which progress has been greatest and to include papers on subjects about which insufficient knowledge previously existed or which were of insufficient technological importance for mention in the preceding volumes.

It will come as no surprise to those engaged in the textile and related industries to find that a large

proportion of the articles have a bearing on the raw materials, plant, and chemicals used therein. For example, there are papers on epoxy resins, polyurethanes, polythene, and silicones, as well as contributions on hydrogen peroxide, peracetic acid, and detergents. There is also an excellent treatment of industrial enzymes, and the articles on water demineralisation, ion exchange, and fluidisation will be of more than passing interest.

The difficulty of presenting the facts at a rate even approaching that of experimentation and discovery is pointedly revealed by the paper on the dyeing of synthetic fibres, which is orderly and informative but inevitably lags a long way behind the present state of knowledge. On the other hand, the editors have looked ahead—and perhaps not all that far—by including papers on solar energy, photovoltaic solar converters, nuclear reactors, and computers. A number of matters of interest to chemical engineers are to be found in contributions on catalysis, distillation, liquid-liquid extraction, and sintered high-temperature and plastic constructional materials. Although primarily a reference book and therefore not designed for normal reading, the considerable determination necessary to make a way to a selected topic through the alphabetical arrangement of the book, without allowing oneself to be led along the by-ways, is a measure of the wealth of interest in the work. There are papers on biologically active chemicals such as steroid hormones, psychopathologicals, pesticides, and antibiotics to tempt the non-specialists, whilst more mundane topics such as emulsion paints cannot easily be passed by.

The binding is robust, the paper and the print are excellent, and the volume is adequately indexed and illustrated. As befits a book of this nature, each article carries a list of references (none of which, it is noted with regret, quotes this *Journal*). Those already in possession of the first fifteen volumes will doubtless be ready to find the necessary expenditure for repairs and renewals; but the quality of the book is such that it is capable of standing alone. One would need to be very insensitive not to be impressed even in these factual pages by the romance, advance, and expansion of chemical technology in what is, after all, a very short space of time.

S. R. COCKETT

Disposal of Industrial Waste Materials

London: Society of Chemical Industry (*Papers read at the Conference at Sheffield University 17-19th April 1956, with the discussions that followed*). 1957. Pp. iv + 157. Price, 50s. 0d.

One of the major problems ensuing from the rapid increase in industrial production is the disposal of waste materials. This has been a subject for urgent discussion in recent years among industrialists and research workers. Symposia have been held at various centres, including Birmingham, Durham, and Sheffield Universities. The same topic has been raised at meetings sponsored by specialist organisations. The work under review is an edited version of the symposium held at Sheffield University in April 1956. One of

the most important factors arising from expanding industry is the effect it is having upon the drainage systems of the country. Rivers have two main functions for industry, the supply of water for industrial use and the disposal of trade waste. These two functions are in many cases inter-related, since the supply for one establishment may in fact be the waste from another, further upstream. It is therefore of importance that effluent disposed into the stream is suitable for re-use. In addition to this practical necessity, there are the legal aspects of the Rivers (Prevention of Pollution) Act 1951, which aims at progressively improving the condition of the rivers.

The topics selected for presentation at Sheffield covered a wide range of industries and processes, illustrating the diversity of the problems, technical and economic, connected with effluent disposal.

Only one minor point of criticism relating to content seems relevant: had the two papers dealing specifically with gaseous effluents been added to the course on *Air Pollution* under the direction of Professor M. W. Thring (presented in September 1956, also at Sheffield University), and the one on *The Disposal of Industrial Atomic Waste Products* been given a separate meeting (as it is a subject of sufficient importance to warrant this), the remaining topics would have made a more homogeneous publication.

A noteworthy point of interest is that many problems in effluent purification are being solved by the new application of well established techniques of mass transfer (used in chemical engineering operations, e.g. adsorption on activated carbon and clays), selective extraction, and ion-exchange methods which are being rapidly developed.

The fundamental value of this publication does not lie in its isolation, but in relation to existing information and the new techniques which are being developed. This and the other recent publications on the subject provide an extremely useful basis for dealing with the immediate problem of effluent disposal.

The Society of Chemical Industry, in issuing the proceedings of the symposium in book form, has made a valuable contribution towards the solution of this problem.

C. W. PAGE

Naturally Occurring Quinones

By R. H. Thomson, Pp. vii + 302. London: Butterworths Scientific Publications. 1957. Price, 50s. 0d.

Although the natural quinones are referred to in such publications as the *Annual Reports on the Progress of Chemistry*, *Houben-Weyl's Methoden der organischen Chemie*, *Elsevier's Chemistry of the Carbon Compounds*, and in several text-books on colouring matters, there does not appear to have been any considerable monograph dealing solely with the naturally occurring quinones.

The present volume deals with more than 150 natural quinones, some of which occur in trees and plants, others in insects, terrestrial and marine animals, and lichens. Many are products of mould

or bacterial metabolism. The author has arranged them in five main groups according as they are related to the benzoquinones, naphthaquinones, anthraquinones, phenanthraquinones, or other types. He has dealt mainly with their chemistry, particularly reactions and structure, but much is included about their origin, isolation, function, and biological effects.

The volume is clearly printed, and the text is fully illustrated with structural formulae. The author's style is lucid, and the numerous references make the volume at once useful and readable. In addition to a general index there is a zoological and a botanical index, in which the origins of the quinones are listed.

A worth-while addition to the literature of quinones.

W. BRADLEY

Organicheskie krasyashchie veshchestva

[Organic Colouring Matters]

By V. G. Shaposhnikov, edited by B. A. Porai-Koshits. 4th edition 1955. Pp. 520. Kiev: Gosudarstvennoe Izdatel'stvo Tekhnicheskoi Literatury USSR. Price, 19 roubles.

Khimiya i tekhnologiya organicheskikh krasitelei

[Chemistry and Technology of Organic Dyes]

By M. A. Chekalin. Pp. 576. Moscow: Gosudarstvennoe Nauchno-tekhnicheskoe Izdatel'stvo Khimicheskoi Literatury. 1956. Price, 14 roubles 30 kopeks.

Khimiya krasitelei

[Chemistry of Dyes]

By B. M. Bogoslovskii and N. G. Laptev. Pp. 435. Moscow: Gosudarstvennoe Nauchno-tekhnicheskoe Izdatel'stvo Literatury po Legkoi Promyshlennosti. 1957. Price, 10 roubles 45 kopeks.

Publication during recent years of these three books gives some indication of the scale of instruction in dye chemistry in the Soviet Union, for some 5,000-7,000 copies of each have been printed. Three additional books are mentioned in the preface to the third of these, viz. *Osnovy sinteza promezhutochnykh produktov i krasitelei* ("Principles of the Synthesis of Intermediates and Dyes") by N. N. Vorozhtsov, *Khimiya krasitelei* ("The Chemistry of Dyes") by I. M. Kogan, and *Poluprodukt'y anilino-krasochnoi promyshlennosti* ("Intermediates of the Aniline Dye Industry") by N. I. Vorontsov, published by Goskhimizdat in 1955, 1956, and 1956 respectively.

The book by Shaposhnikov, written in Russian although published in the Ukraine, was thoroughly revised by the author, but his sudden death prevented him from seeing it through the press. The book is intended to serve as a textbook for advanced students specialising in dye chemistry in colleges of chemical technology. The introduction starts with an outline of the development of the dyemaking industry which does not appear to mention Perkin or 1856, and continues with accounts of the fractionation of coal tar, colour and constitution, classification and properties of

dyes, and the Russian nomenclature of dyes. There follow the twelve main chapters of the book, each devoted to one class of dyes—azo, indigoid, polycyclic vat, anthraquinonoid mordant and acid, sulphur, arylmethane, quinoneimine, quinoline, phthalocyanine, nitroso, nitro, and hydroxyketone and flavonoid. Each chapter gives the characteristic structure of the class, the principal methods of synthesis, and the properties of the majority of the members with an indication of any exceptions. Two features of the book are descriptions of about a hundred laboratory experiments (mainly dye preparations) illustrating the text, and details of individual dyes in each group forming a miniature Russian "Colour Index". A final chapter deals briefly with such topics as the identification of dyes and dyeing theory, and terminates with some interesting figures for dye usage in the U.S.S.R. A list is given of 18 Russian publications concerned with dyes.

Of the total output of colorants, up to 75% is consumed by the textile industry—cotton 55%, wool 15%, knit goods 5%, and silk > 1%—and up to 6% by leather, 2% by paper, 2% by paint and varnish, 3% by printing inks, 1% each by furs and rubber, and about 0.5% by foodstuffs. About half the total output by weight consists of Sulphur Black, with other sulphur pigments amounting to 15%. Azo dyes constitute 36% (of which direct dyes account for up to 60% by weight, acid 28%, mordant and chrome 6%, lake and oil-soluble 5%, and basic 2%). Nigrosines and Indulines 3%, and arylmethane, alizarin, and vat dyes less than 1% each.

The book by Chekalin is intended for students in "tekhnikums" (less advanced technical colleges) and for works instruction. After the usual historical introduction (mentioning Perkin) and account of colour and constitution, the fourth chapter is devoted to the technology of dye production and includes descriptions and diagrams of industrial plant. Ten chapters are concerned with the different classes of dyes, but the purely chemical aspects are less prominent, and stress is laid on manufacture, with flow sheets for the production of many of the colorants, including phthalocyanine blue. The penultimate chapter consists of very brief accounts of the application of dyes to textiles, leather, paper, and plastics and of the application of pigments and lakes. The final chapter, on safety precautions, contains a table of poisonous, inflammable, or explosive substances encountered in the dyemaking industry, with their maximum permissible concentrations.

The third book is intended for advanced students, textile technologists, and students working at home, so that manufacturing aspects are expressly disregarded. The introductory chapter, after making due reference to Perkin and Natanson, contains an interesting outline of the development of the dyemaking industry in the U.S.S.R. A number of small works existed in Russia in the nineteenth century, and in 1888 an annual production of 1,700 tons of synthetic dyes (notably alizarin from imported anthraquinone) came from 16 works. Most of the coal tar was imported, but

attempts were made to use tar from the pyrolysis of petroleum residues as a source of primary aromatics (benzene, etc.). The German firms established branch works where the simpler processes, such as the manufacture of sulphur dyes and azo dyes from imported intermediates, were carried out by entirely German technical personnel: thus in 1912 about 2,250 tons of dyes were imported and 8,400 tons made by these German subsidiaries. The result was that purely Russian production of dyes practically disappeared. During the 1914-1918 war imports ceased, and domestic needs were partly met by the production of the simplest azo and sulphur dyes with primitive equipment in a few small works. With the establishment of the communist régime dye manufacture became a branch of the chemical industry, tonnage and range increased so that imports could be largely dispensed with, and the training of a continuous supply of technologists was undertaken. By 1950 production had increased to 43,000 tons (nearly five times the 1913 figure) and the number of brands to 320 (compared with 186 in 1940). In 1956 the total production of dyes was 77,000 tons.

The second chapter contains an outline of the production of dye intermediates from coal tar and from petroleum, together with an account of the general aromatic reactions on which dye preparation is based. Colour theory, standardisation, application, etc. are discussed, and then follow chapters on the different classes of dyes. The final chapter is devoted to the chemistry of auxiliary products—the various types of surface-active agents, fluorescent brightening agents, and moth-proofing agents.

C.J.W.H.

Untersuchungen über neue Pigmentfarbstoffe

By O. Schmitz-DuMont (*Forschungsberichte des Wirtschafts- und Verkehrsministeriums Nordrhein-Westfalen* No. 193). Pp. 37. Cologne: Westdeutscher Verlag. 1955. Price, DM 11.20.

This volume contains a report of research work carried out on cobalt pigments in which Co^{2+} is linked to oxygen in six- or four-fold coordination. Information is given for the preparation of samples, and the methods of experimental investigation are outlined. The experimental results are given in some detail, and should be of particular interest to research workers in the pigment field. The text contains more information of a fundamental nature than general readers would be likely to require.

The research is based on a theory, suggested by Hill and Howell in 1924, to the effect that 6-coordinated Co^{2+} is red and 4-coordinated Co^{2+} is blue. Several exceptions to this theory are noted, and a method of study is developed to determine the connection between the absorption of radiation and factors such as—(i) type of coordination, (ii) lattice spacing (interatomic distances), and (iii) the nature of the bond between Co^{2+} and O^{2-} .

Compounds of several types have been prepared for each of these specific purposes, e.g.

$\text{Co}(\text{Al}_{1-n}\text{Ga}_n\text{O}_4)$ from CoAl_2O_4 to CoGa_2O_4 , a range in which the lattice spacing increases from the aluminate to the gallate. These compounds contain tetrahedrally coordinated Co^{2+} , while isomorphous replacement of Mg^{2+} by Co^{2+} in the magnesium oxide lattice gives octahedrally coordinated Co^{2+} , which also occurs in the compounds $\text{Co}_n\text{Mg}_{1-n}\text{In}_2\text{O}_4$. Anomalous absorption spectra obtained in the case of cobalt magnesium titanates have been related to the nature of the bonding between cobalt and oxygen by means of the high magnetic moments determined for these compounds. A study has also been made of the system $\text{Ba}(\text{Zn}_{1-n}\text{Co}_n\text{PO}_4)_2$.

Absorption spectra have been determined from the reflectance of powders on the basis that, with controlled conditions, in particular a standard particle size, the intensity of absorption E is related to the reflectance factor R by the expression $E = \log (100/R)$. Although the absolute values for extinction coefficients cannot be obtained in this way, the values of E are comparable for different solids. The results are represented as plots of intensity against wave number, and an interpretation of the spectra, based on the expected energy terms for Co^{2+} , is given.

X-Ray data have been obtained by the Debye-Scherrer powder method. The lattice spacings and interatomic distances (Co-O) in the various solid phases are tabulated. Changes in structure at definite atomic percentages of Co^{2+} are noted in some cases, and related to the changes in the colour of the pigments.

Although there are some misprints in the formulae given, these are reasonably apparent, and the report gives the impression of sound work systematically carried out and clearly recorded.

ERIC COATES

Chemisorption

Proceedings of a Symposium held at the University College of North Staffordshire by the Chemical Society 16-19 July 1956. Edited by W. E. Garner. London: Butterworths Scientific Publications. 1957. Pp. xii + 277. Price, 50s. 0d.

This publication is difficult to review because it is not really a book but a collection of research papers. It is divided into sections—one on the theory of chemisorption and others dealing with chemisorption on insulators, metals, semiconductors, and carbon.

Chemisorption, the chemical reaction between molecules and the surfaces of solids, is of interest to readers of the *Journal*, since all are concerned with such reactions. Nevertheless, not all the 23 papers are of sufficient interest to warrant abstracting. Even if this were done, the valuable discussion at the end of each section would be lost. The following papers have, therefore, been selected for special comment—

The quantum and electronic interpretations of chemisorption are expounded in three papers—*Chemisorption and Valency* by D. Dowden, *The Quantum Mechanics of Chemisorption* by T. B. Grimley, and *Chemisorption on Semiconductors* by

F. S. Stone. The first provides a general summary of the subject and shows how it differs from physical adsorption.

Of greater interest is *The Decrease in Heat of Chemisorption with Coverage* by J. H. de Boer, for this theory can obviously be applied to heats of dyeing, or to the adsorption of water by textiles. Similarly, the paper *Chemisorption on Alumina and Silica Gels* by J. J. Kipling and D. B. Peakall, concerning the adsorption of water and alcohols, may offer suggestive ideas on the effect of carriers in dyeing or be of use to those using such gels in chromatographic columns, for example. *The Sorption of Water by Oxides* by S. J. Gregg is equally significant.

Chemisorption of Oxygen on Carbon by H. Harker, H. Marsh, and W. F. K. Wynne-Jones also deals with its ability to absorb alkali, and this should throw light on the mode of action of activated charcoal as a decolourising agent.

Chemisorption on Cuprous, Nickel, and Cobaltous Oxides by R. Rudham and F. S. Stone suggests an equation for the rate of monolayer formation.

Not obviously of interest is the paper by R. J. Davies on the *Antiferromagnetic Properties of Chromium Sesquioxide*. Yet the interactions of this substance with adsorbed materials are used to provide an explanation of why it (and the related catalysts vanadium sesquioxide and molybdenum dioxide) are effective as the main commercial catalysts of dehydrogenation and cyclisation.

Naturally, the appeal of this book will be limited to those primarily engaged in theoretical work, and it is difficult reading for those unfamiliar with quantum electronic jargon, but odd pages may be found in English. It is not a book to buy for oneself, but should be available on the library shelf.

L. PETERS

The Visual Pigments

By H. J. A. Dartnall. Pp. vii + 216. London: Methuen & Co. Ltd. 1957. Price, 30s. 0d.

Our knowledge of the visual pigments has greatly increased during the last 20-25 years, so Dr. Dartnall's book will be welcomed by the increasingly large number of people who are interested in various aspects of colour vision.

In an introductory chapter, the author discusses the anatomy of the eye, leading to the visual pigments, viz. coloured substances which can be obtained from the rod-cone layer of the retina. Methods of extracting these pigments from various biological sources are discussed; then the visual pigments, in a reasonably pure condition, are characterised by measuring their light-absorbing properties. This is done by plotting optical density against wavelength to obtain the density spectra. The term "visual purple (rhodopsin)" is reserved for the pigment found in humans, in other mammals, and in three amphibians, and the expression "visual violet (porphyropsin)" refers to fish pigments. Dr. Dartnall shows that the products resulting from the bleaching of these visual pigments differ greatly according to the conditions of exposure, viz. temperature and pH.

In Chapter III the physical chemistry of visual purple is discussed, and, as might be expected, its photosensitivity is among the highest recorded for any substance.

The next chapter deals with the chemical structure of rhodopsin, which is a chromoprotein; i.e. its molecule consists of a protein, "opsin", to which is attached a chromophore, which constitutes the reactive part of the molecule. The changes which take place when rhodopsin is exposed to light in the retina are discussed from a chemical standpoint. Briefly, the photochemical change is the separation of the chromophore from the protein first to form yellow retinene, then to produce colourless vitamin A₁ (C₁₉H₂₇·CH₂OH). Retinene is the aldehyde of vitamin A₁, viz. C₁₉H₂₇·CHO. There are various schools of thought regarding the mode of attachment of the chromophore of visual purple to its protein, but probably the aldehyde group condenses with a protein amino group; also thiol groups in the protein react with another part of the retinene molecule.

A chapter follows dealing with *cis-trans* isomerism of vitamin A and retinene, which sheds more light on the structure of other photosensitive pigments. For example, porphyropsin is shown to possess the same protein as rhodopsin, but has a different chromophore, and on p. 154 several light-sensitive pigments are listed, together with their protein and carotenoid components.

In Chapter VI Dr. Dartnall discusses some of his own work using a freshwater fish, viz. tench, and shows that the extracts from the tench retinae are not homogeneous but contain two light-sensitive components. By applying a method of partial bleaching to other fish retinal extracts, five rod pigments have been detected, which shows that the visual pigment situation is more complex than was formerly realised.

The final chapter mentions new methods of studying visual pigments, from which further additions to our knowledge are resulting. The absence of visual purple at the fovea and at the blind spot of the human eye is indicated. There is also a hint that a cone pigment may be present in a frog's retina.

There is a good index and also at the end of each chapter a valuable list of references. Although parts of the book are rather difficult to understand unless the reader is well grounded in theoretical chemistry, the author can be congratulated on producing a valuable and comprehensive account of the visual pigments.

F. JORDINSON

The Measurement of Colour

By W. D. Wright. London: Hilger & Watts Ltd. 2nd edition 1958. Pp. x + 263 + 8 plates. Price, 52s. 0d.

This book in its original form has been an invaluable aid to all who deal or dabble in colour. There are a multitude of systems that have been devised to specify colour, but the one that has been fundamental to all others since 1931 is the trichromatic system recommended by the Commission Internationale de l'Éclairage. It is with the

intricacies of this system that Professor Wright's book chiefly deals. Some two-thirds of the book has been rewritten, and the main changes affect the chapters on the principles of photometry and colorimetry and on the C.I.E. system. An additional chapter has been added on three-colour reproduction, which is particularly pertinent in connection with colour television. In this field the application of the principles of colorimetry has been quite spectacular.

Professor Wright's unrivalled authority and his ability as a writer together make this revised edition a valuable asset to all who are interested in the quantitative aspects of colour. This is a subject which is becoming of increasing importance to industry, and, since there are relatively few comprehensive accounts of the development and application of the C.I.E. system, this is a book that needs little recommendation.

The treatment of the subject is developed in a logical manner, commencing with an account of the nature of radiation in the visible spectrum, with particular reference to the characteristic emission from different sources, and the absorption and reflection of light by matter. This is followed by an account of the behaviour of the eye as a receptor of light, and then through the principles of photometry and colorimetry into a lucid approach to the 1931 C.I.E. system of colour measurement. The mathematics involved is simple enough, but difficulty often arises because of a lack of understanding of the concepts associated with colorimetric algebra. The *T*-unit is often a source of difficulty, but is nicely dealt with by Professor Wright by the use of analogy. The use of simple analogies, and coloured diagrams in the text, is a noteworthy feature, which assists in the comprehension of rather difficult concepts.

The practical aspects of colour measurement are dealt with adequately, within the scope of the book, except, perhaps, that a few worked examples on typical colour problems would have added value to an otherwise excellent book. The inclusion of distribution coefficients and other data for the standard illuminants increases the usefulness of the book in the laboratory, while numerous references in the text allow the reader to develop his study further, should he so desire.

ERIC COATES

The Reproduction of Colour

By R. W. G. Hunt. Pp. 208 + 87 figures and 10 colour plates. London: Fountain Press. 1957. Price, 63s. 0d.

Colour is increasingly used in modern life, especially in illustrations of all sorts—in books, advertisements, photographs, and even television pictures. Reproduction of coloured illustrations on paper by lithographic printing has been practised for well over a century and instantaneous colour photography for fifty years. Since the Second World War, however, colour photography has been practised on a greatly increased scale, as a result of the perfection of the subtractive tripack processes achieved initially by the Kodak and the Agfa organisations just over twenty years ago, and

colour transparencies, prints, and motion pictures are now a commonplace. The ease with which colour pictures of moving objects can now be obtained, especially in large negative sizes, has led to a great expansion in colour illustration in books. This in turn has stimulated the introduction of new methods of printing from original colour photographs, whereby electronic means supersede much tedious manual work. Now the advent of colour television has introduced another entirely new form of colour reproduction.

In this volume Dr. Hunt, who is an acknowledged authority in the field, surveys the physical principles underlying all these processes. In the first chapters he gives a simple, clear, and well illustrated description of the general principles of visual appreciation of colour and of the additive and subtractive methods of reproduction. In the later chapters he gives a more detailed and mathematical treatment of colour measurement and specification, of colour printing by letterpress, lithography, and gravure, of colour television, colour correction by masking, and light sources. This section includes discussions of the colour triangle and of the trichromatic system of colour measurement.

The descriptions of the electronic reproduction of photographs and of colour television will be found especially interesting by non-specialist readers, who up to now have had few opportunities of reading simple and authoritative accounts of these new techniques. It is notable that the additive processes once used for colour photography have been revived in colour television.

The diagrams, many in colour, are clear and informative, and a number of striking reproductions of colour photographs are included. This book can be recommended to all who are concerned with the use of colour in photography or printing, and much of it can be read with profit and pleasure by any non-specialist.

C. H. GILES

An Introduction to Electronic Absorption Spectroscopy in Organic Chemistry

By A. E. Gillam and E. S. Stern. 2nd edition 1957. Pp. xi + 326. London: Edward Arnold (Publishers) Ltd. Price, 50s. 0d.

The appearance of the second edition of this book will be welcomed by all those organic chemists (and there can nowadays be few exceptions) who, for one reason or another, are interested in absorption spectroscopy. It has been enlarged to give up-to-date advances in instrumentation, and examples of the use of spectroscopy in the elucidation of structure. Newer applications described include the graphical extinction-ratio method for the determination of mixtures, and the estimation of dissociation constants of acids and bases.

As Dr. Stern points out in the preface, it is not meant to be a handbook for a dye chemist. Nevertheless, it is a pity that the opportunity has been missed of including the large amount of available basic work on colour and constitution, notably by Brooker. The latter illustrates more clearly than

any examples given the basic relationships between resonance, absorption, and structure. It so often interests the reviewer to note how many professors of organic chemistry are struck by the surprising colour of their compounds but seldom by the absence of colour.

There are a number of misleading statements which have been carried over from the first edition. For instance, other than in saturated systems, what claims have the chromophores to engulf electron-accepting auxochromes but not electron-donating auxochromes? Bathochromic shifts can be introduced as easily by nitration as by amination.

On p. 80 it is stated, in effect, that an increase in the number of resonance forms in a related series results in a bathochromic shift, and on p. 129 that the introduction of an auxochrome in a side-chain causes little shift in absorption peaks. There are, however, many examples of the introduction of such a group into the chromophore which, usually, also increases the number of contributing resonance structures and yet which causes a profound hypsochromic shift. Thus, Michler's hydrol (blue) is converted to Auramine (yellow) on the introduction of an amino group into the chain.

The book is very readable, and remains an exceedingly useful introduction to spectroscopy for the organic chemist.

E. B. KNOTT

Über Silikone und ihre Anwendung in der Textilveredlung

By W. Weltzien and G. Hauschild. *Forschungsberichte des Wirtschafts und Verkehrsministeriums Nordrhein-Westfalen* No. 161. Pp. 120. Cologne: Westdeutscher Verlag. 1955. Price, DM 27.00.

The authors claim in their introduction that, although outlets for silicones have been created in the textile industry in the last 15 years, particularly in the U.S.A., their general acceptance has been rather slow, partly owing to their high cost. In this investigation the authors have set themselves the task of elucidating the reactions involved in the application of silicones to textiles, in order to provide the industry with information which is not readily available from other sources. Besides a quantitative examination of the production of water-repellent effects on textiles by means of silicones, this report includes also a detailed investigation of the physical and fastness properties of the treated materials.

The report is divided into three parts. The first is of an introductory nature (19 pp.), and covers much well known ground, including the preparation and manufacture of organo-silicon compounds, and their polymerisation to polysiloxanes. This is followed by a brief description of the technically useful polysiloxanes, such as fluids, resins, and rubbers. The production of water-repellency by silicones is briefly reviewed, and an account is given of commercially useful products.

The second is the "analytical-chemical" part (39 pp.), and deals with an accurate method of determining silicon in silicones (modification of the Parr bomb technique). Next elucidation of the

chemical composition of the commercial silicones used is followed by determination of the chemical changes which take place during polymerisation. The effects of oxygen and of unsaturated compounds on the rate of polymerisation are established; and the silicone content of the impregnated materials before and after high-temperature polymerisation is studied.

The third, i.e. the "chemical-technological", part (37 pp.) is probably the most useful from the finisher's point of view. It deals with optimum concentrations of silicone solids to be deposited on different fabrics, the type of bond formed between silicones and the fibre, the effectiveness of the silicone proof vis-à-vis a conventional wax proof, the merits of the solvent *versus* the emulsion treatment, and a lot of other topical problems, of interest to both chemist and finisher. This part also covers the results of fastness tests to washing and dry-cleaning, and the last section is an account of tearing strength, crease angle, and abrasion resistance measurements. A summary of all the investigations brings this research report to a close. The results of the many experiments are given graphically whenever possible, although the numerical data are available in tabular form as an appendix. The latter also includes a number of illustrations.

The general impression of this research account is very good; this is not unexpected, in view of the eminence of one of its authors, and of the reputation of its place of origin (Textilforschungsanstalt Krefeld). The worker in this field, however, is not likely to agree with all the findings, and particularly with their interpretations. Thus it is stated on p. 79 that the proof is the same, whether the two silicones investigated (*viz.* Wacker's WS 60 and Dow Corning's Decetex 104) are applied from an organic solvent or from an aqueous emulsion medium. This is certainly not the general experience of manufacturers and workers in this field. Although an organometallic aluminium compound is frequently used with the Wacker product, no metal catalyst seems to have been used with the Dow Corning product. In fact, the whole question of catalysis of silicones is practically ignored, although nowadays few textile applications aiming at good water-repellency would be undertaken without recourse to a suitable catalyst. A further point of criticism is that, although comparisons of water-repellent effects produced are made by the Bundesmann technique, only % absorption figures are given; surely, without the penetration figures, no complete assessment is possible. Their omission seems somewhat strange.

The printing, which is direct from typescript, is very clear and easy to read. Printer's errors are few and far between: "explosionsartig" (p. 27) requires amending, and so does the formula on the left-hand side of p. 39. The numbering of the illustrations in the text does not agree with that in the appendix.

This is a most informative investigation, and should prove of considerable interest to all engaged in this field.

G. W. MADARAS

Plastics Progress 1957

Papers and Discussions at the British Plastics Convention 1957

Edited by Philip Morgan. Pp. viii + 394. London: Iliffe & Sons Ltd. 1958. Price, 50s. 0d.

This volume consists of diverse types of papers by specialists in different fields of plastics technology, and as such it is difficult for a single person to review it adequately.

The volume has been roughly divided into studies of polyolefins, polythene, polyvinyl chloride, extrusion, injection moulding, material developments, and glass-reinforced plastics. The majority of the papers are of interest mainly to the engineer and the technologist engaged in the manufacture of these plastic materials. The actual chemistry of plastics and the theory of polymerisation are secondary to properties and production.

The excellent opening paper by H. F. Mark on the polymerisation of olefins could well be expanded. One feels that the author has compressed a vast amount of information into too little space. This is followed by a paper on high-pressure polythene which may be useful to the technologist producing commercial polythene. A paper from ICI (Alkali Division) on measurements of chain length by light scattering in solution includes a full account of the apparatus used, and as such is of more general value, whilst a further paper by Rogers *et al.*, on the effect of crystalline/amorphous ratio on the permeability of polythene to solvent vapours, shows this field to be still in the embryonic stage and gives excellent opportunity for further research. The paper on factors influencing long-term stress properties of polythene will be valuable to technologists interested in plastic-coated wire.

Of the papers on polyvinyl chloride, that by Lever and Burke on methods of manufacturing the foamed plastic and its applications is an excellent general account of interest to any chemist, whilst the paper by Horsey on plasticised polyvinyl chloride sheds new light on the mechanism and the effect of this treatment.

The specialist papers on extrusion and injection moulding are more valuable to the chemical engineer than to the chemist. Many of the other papers are disappointing, as they vary between trade information on the one hand and the use of materials in very specific circumstances on the other.

All in all, the volume contains some excellent specialist papers by authorities in their specific

fields, but, except for one or two outstanding examples, one feels that these would be better submitted as communications to research journals, where interested specialists can read them, rather than binding such diverse types into one volume. Whilst the book will be of great value to libraries, the private buyer will find himself paying for a large amount of uninteresting material in order to read three or four papers of specific value to himself.

R. S. ASQUITH

New Books received

Supplement to British Chemicals and their Manufacturers. London: Association of British Chemical Manufacturers. 1958. Pp. 30. Gratis.

Laboratory Chemicals and Testing Outfits Catalogue. Poole, Dorset: British Drug Houses Ltd. 1958. Pp. viii + 331.

Analysis. A Series of Papers Reprinted from "Research" Volume 9, 1956. London: Butterworths Scientific Publications. 1957. Pp. iii + 60. 8s. 6d.

Dow Light Absorbers. Midland, Michigan: Dow Chemical Company. 1957. Pp. 16.

Biological Staining Methods. G. T. GURR. Sixth edition 1957. London: George T. Gurr Ltd. Pp. vi + 102 + 3 colour plates. 5s. 0d.

Natural and Synthetic Fibers Yearbook 1957. M. HARRIS and H. MARK (editors). New York: Interscience Publishers Inc. 1957 and 1958. Pp. iii + 1144. \$45.00.

Absorption Spectrophotometry. G. F. LOTHIAN. Second edition 1958. London: Hilger & Watts Ltd. Pp. viii + 246. 52s. 0d.

Moderne Wasch- und Reinigungsmittel. Heft II-1 Waschen und Reinigen. Die Waschwirkung und ihre Prüfmethoden. I—Nachtragsband mit Anschluss-Literatur 1951-1954. (Archiv No. 888. S.K.B. No. 2/1770). H. MANNECK. Garmisch-Partenkirchen: Moser-Verlag, F.E.B. Archiv. 1955. Pp. i + 52. DM 20.00.

Die Wirkung von Waschmitteln auf die Haut. Eine Sammlung von grundlagenerkenntnissen und ihre praktische anwendung unter besonderer berücksichtigung synthetischer waschund reinigungsmittel. H. STÜFEL and A. SEAKALL. Heidelberg: Dr. Alfred Hüthig Verlag G.m.b.H. 1957. Pp. xv + 261. DM 26.00.

Identification of Textile Materials. Fourth edition 1958. Manchester: Textile Institute. Pp. 80 + 123 figures + viii. 27s. 6d.

Optische Aufheller ("Farblose Fluoreszenzfarbstoffe") Grundlagen-Eigenschaften-Anwendungen. (Archiv No. 892. S.K.B. No. 2/1791). E. ÜHLEIN. Garmisch-Partenkirchen: Moser-Verlag, F.E.B. Archiv. 1957. Pp. i + 86 + ii. DM. 30.00.

Bleaching, Dyeing, and Mercerizing. Test Results on Some Varieties of Cotton Grown by Selected Cotton Improvement Groups, Crop of 1955. Agriculture Information Bulletin No. 167. Washington: U.S. Government Printing Office. Oct. 1956. Pp. i + 21. 15 cents.

Printing and Litho Inks. H. J. WOLFE. Fifth edition 1957. New York: MacNair-Dorland Co. Pp. 489. \$9.25.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, 23 (Jan. 1952) and also, together with symbols and the periodicals abstracted, in the annual index

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Separation and Recovery of Carbon Black from Gaseous Suspensions

Phillips Petroleum Co. USP 2,785,769
USP 2,785,964

Carbon Black (C.I. Pigment Black 7)

Phillips Petroleum Co. USP 2,785,053
A furnace for producing carbon black in high yield. It provides increased radiant surface area without an undesirably high pressure drop.

USP 2,785,054
An improved furnace for producing high abrasion furnace (HAF) and super-abrasion furnace (SAF) blacks. C.O.C.

Continuous Treatment of Filamentary Materials

Celanese Corp. of America BP 793,210
The material is treated with a liquid while it is in the general form of a series of crunodal loops arranged in a spiral of diameter greater than that of the individual loops. The axis of the spiral is vertical or at an angle of $> 30^\circ$ to the vertical. The material is continuously fed to form one end of the spiral, treated material being continuously withdrawn from the other end in an uncoiled condition. Preferably successive convolutions of the spiral rest on one another so that the material under treatment forms a hollow more or less cylindrical pile. C.O.C.

Continuous Bleaching Range Control

C. A. Davis and J. E. Newton USP 2,785,559
A stop motion for use in moving fabric in rope form from the J-box to a driven unit. C.O.C.

Web Guiding Heads

J. Dugler BP 793,334
An improvement in the sensitivity and effectiveness of a device where each selvage is gripped by a pair of rollers which automatically correct any tendency of the fabric to deviate from its assigned path. C.O.C.

Web Winding Machine

Paper Converting Machine Co. BP 793,490
A number of core shafts, projecting inwardly in parallel alignment, are fixed at one end to a rotatable turret which moves the core shafts intermittently through spaced accurate distances defining operating stations. At the first station the shafts receive cores which are cut into segments at the next station. A correspondingly slit web is wound on to the segments at another station and the wound cores are removed from the shafts at the final station of the turret. All the operations are carried out while the turret is stationary. R.A.

Continuous Open-width Treatment of Fabric

Mezzera BP 793,283
The fabric passes through the bath while festooned from rods and enters it by passing through a device which also supplies liquid downwards to the bath. This liquid on leaving the supply device is directed toward the selvages of the fabric and so thoroughly stretches it and prevents formation of wet folds in it. C.O.C.

Continuous Treatment of Fabric

H. W. Butterworth & Sons Co. USP 2,785,890
A machine in which the fabric is kept under uniform tension. C.O.C.

Drying Leather

N.V. Nederlandse Schoen- en Lederfabrieken Bata-Best BP 794,765
The leather is pasted upon curved plates on which it is dried. The plates are preferably made of sheet steel coated with a lacquer to prevent corrosion. C.O.C.

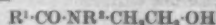
Dyeing and Finishing Frieze and Pile Fabrics containing Man-made Fibres (VIII p. 564)

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

PATENTS

Bactericidal Detergents

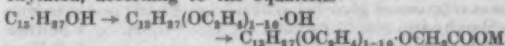
ICI BP 794,036
A mixture of a quaternary ammonium compound and one of formula—



(R^1 = branched or not branched, satd. or unsatd. chain of > 10 C; R^2 = H or β -hydroxyethyl) is a good bactericidal detergent, e.g. a mixture of palm kernel oil diethanolamide, the condensate of octylcresol with 9 mol. of ethylene oxide, and cetyltrimethylammonium bromide. C.O.C.

Carboxymethylated Glycol Ethers

S BP 793,113
Bonded-chain primary alcohols of 13 C are condensed with 1–10 mol. of ethylene oxide and the products carboxylated, according to the equations—



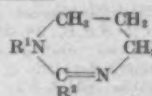
(M = H or cation). The products are more active and have a greater range of use than the uncarboxymethylated products. Thus unlike the uncarboxymethylated polyglycol ethers they can be used as wetting agents in alkali liquors of 1–10° Bé. C.O.C.

Polyvinyl Acetate Emulsions Stabilised with Hydroxyethyl Cellulose

Shawinigan Chemicals BP 793,498
Emulsions of polyvinyl acetate stabilised with hydroxyethyl cellulose are heated to $< 40^\circ\text{C}$. and then 0.3–3.0% glyoxal on the weight of the polyvinyl acetate is added. The resultant emulsion yields films and coatings which on drying have highly improved water resistance. C.O.C.

Mildew-proofing Agents for Leather and Textiles

Armour & Co. BP 793,749
Compounds of formula—



(R^1 = aliphatic hydrocarbon radical of 6–18 C; R^2 = H or CH_3), e.g. 2-methyl-3-dodecyl-3,4,5,6-tetrahydropyrimidine, are mildewproofing agents, 0.5–5.0% giving effective protection to leather and textiles. C.O.C.

Gas-fume Fading Inhibitors for use on Acetate Rayon or Polyester Fibres

BrC BP 793,701
The fibres are first treated with an aqueous Zn salt having a swelling action and then with aqueous alkali so that 0.5–2.5% of an insoluble basic zinc compound (calculated as ZnO) is formed within the fibres. C.O.C.

Organic Titanium Compositions of Good Stability to Alkali

National Lead Co. BP 793,760

Aqueous solutions of chelated titanium salts of an α -hydroxy carboxylic acid and a polyol of 3–5 C and containing 3–8 OH groups which are present on adjacent C atoms are stable under alkaline conditions. The Ti salt should contain 1–4 moles of α -hydroxy acid per gram atom of Ti and the mole ratio of the Ti to polyol should be 1:0.1 to 1:2. Thus an aqueous solution of Ti monolactate became immediately turbid at pH 13 but a similar solution containing 0.5 mole sorbitol per gram atom of Ti remained clear when kept for 4 weeks at pH 13. They are used as auxiliary agents, thus nylon is readily dyed with C.I. Direct Blue 71 in presence of salt and the above solution. C.O.C.

Oil (Organosiloxane)-in-Water Emulsions

Midland Silicones BP 793,501
An oil-in-water emulsion comprises (a) a solution of a water-insoluble substance, e.g. an organosiloxane whose

units are of formula R_nSiO_{4-n} (R = monovalent hydrocarbon which may be halogenated; n has an average value of 0.5–1.5), (b) a dimethylsilicon ester of a polyalkylene glycol consisting essentially of 5–95 mol. % $-(CH_2)_nSiO-$ units and 95–5 mol. % polyalkylene glycol residues, and (c) water. C.O.C.

Conversion Products of High Carbohydrates or Carbohydrate Ethers—Finishing Agents

N. V. Eldeka BP 794,569

A higher carbohydrate and/or carbohydrate ether, e.g. farina or ethyl cellulose, is treated with $\geq 50\%$ aq. organic carboxylic acid. The products have very wide uses including use as finishing agents for textiles. C.O.C.

Insolubilised Cellulose Ethers

Johnson & Johnson

BP 794,565

A free acid cellulose glycollic (or hydroxypropionic) acid ether is treated with an aldehyde insolubilising agent, e.g. HCHO or glyoxal, in a solution containing available ammonium ions. On drying the solution the product becomes insoluble. Such solutions can be used as finishes, coatings, etc. or can be extruded to form fibres. C.O.C.

Non-gelling Solutions of Acrylonitrile Polymers

Vereinigte Glanzstoff-Fabriken

BP 794,396

Acrylonitrile polymers or copolymers readily dissolve in a mixture of glycolic acid nitrile (60–95) and ethylene chlorohydrin (40–5) to yield solutions which tend neither to decompose nor to gel. C.O.C.

Aromatic Sulphonium Compounds—Intermediates for Dyes, Pigments, Textile Auxiliary Agents and as Paint Additives (IV p. 560)

Condensates of Styrene Oxide with Ureas or Thioureas—Textile Auxiliary Agents and Intermediates for Dyes (IV p. 560)

Aluminium Phosphate for imparting Soil-resistance to Textiles (X p. 566)

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Reduction of Nitrophenols at the Multiple Dropping Mercury Cathode

L. N. Vertyulina and N. I. Malyugina

J. Gen. Chem. U.S.S.R., 28, 304–308 (Feb. 1958)

The reduction of *o*-, *m*-, and *p*-nitrophenol at the multiple dropping mercury electrode in both aqueous and aqueous-alcoholic solution (pH 2–2.5) has been investigated. The authors show that reduction of the *ortho* and *para* isomers results in the formation of the corresponding aminophenol, the quinoneimine occurring as intermediate. In the case of *m*-nitrophenol reduction leads to the formation of the hydroxylamine derivative and *m*-aminophenol in almost equal proportions. The yield in the case of the *p*-, and *m*-nitrophenol is less in aqueous alcoholic solution than in water whilst the *ortho* isomer gives the same yield irrespective of the solvent. G.J.K.

Field Effects and Non-electrostatic Polar Effects of Substituents on the Basicity of the Phenoxide Ion, Aniline, and *NN*-Dimethylaniline

A. V. Willi

Helv. chim. Acta, 40, 2032–2040 (Dec. 1957)

Ionisation Constants of Substituted *NN*-Dimethylanilines in Water and in Water-Dioxan Mixtures at 20°C.

A. V. Willi

Helv. chim. Acta, 40, 2019–2031 (Dec. 1957)

o-Alkylation accompanying the Direct Formation of Diazonium Salts from Phenols

J. M. Tedder and G. Theaker

Chem. and Ind., 1485 (9th Nov. 1957)

Phenols with ethyl nitrite in ethanolic hydrochloric acid give moderate yields of the corresponding ethoxybenzene diazonium salts, e.g. *m*-cresol \rightarrow 4-ethoxy-2-methylbenzenediazonium chloride. C.H.R.

Arylation of Quinones by Diazonium Salts

P. Brassard and P. L'Écuyer

Canadian J. Chem., 36, 700–708 (April 1958)

I—Synthesis of Monoaryl-*p*-benzoquinones

A detailed study of the reaction between diazonium salts and *p*-benzoquinone shows that optimum conditions are an aq. alcoholic medium, a reaction temp. range of 10–15°C., and a pH of 5 given by buffering with sodium acetate. Of the diazonium salts tested, the chloride, bromide, phosphate, and sulphate give very similar results, but the nitrate is unsatisfactory. Cuprous chloride accelerates the reaction but is prone to give by-products. The yields are only slightly affected by the nature of the substituent in the diazonium salt. An excess of 20% *p*-benzoquinone facilitates the purification of the reaction product. 20 Aryl-*p*-benzoquinones are described.

II—Synthesis of the 2:5-Bisaryl-*p*-benzoquinones

Ibid., 709–711

A general method for the preparation of this class is described which is based on the reactions of diazonium salts with monoaryl-*p*-benzoquinones. 10 examples are reported. H.H.H.

Physical Properties of Aminoazobenzene Dyes

E. Sawicki

VI—Intramolecular Hydrogen Bonding and Tautomerism in 4-Hydroxyazobenzene Derivatives and High Homologues

J. Org. Chem. 22, 7435 (1957)

The phenylhydrazones \rightleftharpoons azo dye tautomerism of 4-phenylazo-1-naphthol (I) and 5-phenylazo-8-hydroxyquinoline (II) and their 2'-CH₃ (Ia, IIa), 4'-CH₃ (Ib, IIb), 2'-COOCH₃ (Ic, IIc) and 4'-COOCH₃ (Id, IIc) derivatives has been studied by determining the ratios of the molar extinction coefficients (ϵ_s/ϵ_a) at the wavelength maximum of the phenylhydrazone and azo tautomers in 95% alcohol containing 0.2% dioxane. In IIc the intramolecular H bond between the methoxycarbonyl ketonic O and the azonium H involved in the 6-membered ring of the phenylhydrazone tautomer was of the same order of energy as the intramolecular H bond between the heterocyclic N and the hydroxyl H in the 5-membered ring of the azo tautomer. The 2'- and 4'-electron donor and electron attractor substituents studied had similar qualitative effects on the tautomerism of I in alcohol and the tautomerism of the monocationic salt of 4-(CH₃)₂NC₆H₄N₂C₆H₄ R (III). In III the presence of a 2'-COOH group considerably increases the proportion of the C tautomer involving proton addition to the β -N as compared with the A tautomer. This increase is attributed to the stabilisation given by the intramolecular H bonding involving the azonium H and the carboxyketonic O.

VIII—Absorption Spectra in Acid Solution

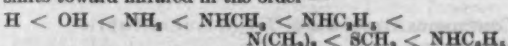
Ibid., 1084–1088

Chem. Abs., 52, 3812–4 (10 March 1958)

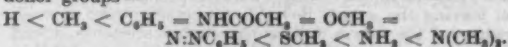
The absorption spectra of 80 azo dyes are given. The long wavelength bands of the monocationic salts of 4-subst. and 4:4'-disubst. azo dyes in 50% alcoholic *N*-HCl were measured and tabulated. In 4-subst. azo benzene derivatives the λ_{\max} of the band associated with the cationic resonance structure



shifts toward infrared in the order —



In 4-(CH₃)₂NC₆H₄N:NC₆H₄ (I) there is gradual shift towards the infrared with 4'-substitution of the electron donor groups —



This shift is attributed to the increased importance of structures involving electronic oscillation from one end of the molecule to the other. Since definite shift to the infrared was observed for the monocationic salts of 2'- and 4'-alkoxy and amino derivatives of I and none for 3'-derivatives as compared with I, the red shift is considered as being caused by an extra conjugative effect. The spectral red shift in a homologous series of monocationic salts, e.g. 4-HOC₆H₄N:NC₆H₄, 1:4-HO(C₆H₄N₂)₂C₁₀H₈ and II is postulated as being caused by the increase in stability of the *p*-quinone excited state structures and to the consequent decrease in the energy change involved in the transition of the molecule from the ground state to the excited state with absorption of light energy. Investigation of the absorption spectra of azobenzene dyes

containing a 4-alkylthio or 4-phenylamino substituent in acid solution indicated the probably complete predominance of the cationic tautomer as shown by the C_λ/A_λ ratios of the dyes. Comparison of the λ bands (arising from the tautomer involving proton addition to the amino N atom) of all types of 4-aminoazobenzene monocations with the absorption maximum of the deaminated analogues in alcoholic solution showed the appearance of the maximum in the same region as shown in the tabulation of bands caused by iso- π -electronic structures of compounds of formula $4-ZC_6H_4N=N(C_6H_4)_2X$.
C.O.C.

Colour of Diaminopyromellitic Esters and Related Compounds

L. I. Smith and R. L. Abler

J. Org. Chem., **22**, 811-816 (1957);
Chem. Abs., **52**, 3724 (10 March 1958)

3,6-Diaminopyromellitic acid tetramethyl and tetraethyl esters are inherently coloured compounds and the colours do not arise from presence of diimino compounds or from quinhydrones formed from diimino and diamino compounds. The inherent colour must result from some interaction between the N atom(s) with the lone pair(s) of electrons and the carboxyl or ester groups. The number of possible resonance forms involving such interactions in these compounds together with their colours are given in tables. It seems that for colour at least 3 of these resonance forms must be possible and that, in general, the more resonance forms possible, the deeper the colour.
C.O.C.

Disperse Monoazo Dyes from Epichlorohydrin

N. Kuroki, A. Katayama, and K. Konishi

Kogyō Kagaku Zasshi, **59**, 626-630 (1956);
Chem. Abs., **52**, 4987 (25 March 1958)

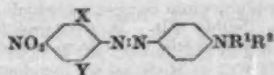
Epichlorohydrin (I) with N-alkylanilines (alkyl = CH_3 , C_2H_5 , and C_4H_9) gave the corresponding N-alkyl-N-(2-hydroxy-3-chloropropyl)anilines (II) by heating in equimolecular proportions in ethanol, and tetrahydro-1-alkyl-3-quinolins (III) with 1 mol. I and 3 mol. alkyl-aniline at 130-140°C. With potassium acetate II (alkyl = C_2H_5) gave N-ethyl-N-(2-hydroxy-3-acetoxypropyl)-aniline (IV), which on hydrolysis gave N-ethyl-N-(2,3-dihydroxypropyl)aniline (V). Coupling II, III, IV, or V with diazotised p-nitro-, 2,4-dinitro-, and 2,6-dichloro-4-nitroaniline gave disperse monoazo dyes. The dyes derived from IV and V had good dyeing properties on acetate, Vinyon and nylon 6, whereas those derived from III had poor dyeing properties.
E.S.

Disperse Monoazo Dyes having an N-Hydroxyalkyl or N-Cyanoethyl Group

N. Kuroki and K. Konishi

Kogyō Kagaku Zasshi, **59**, 619-626 (1956);
Chem. Abs., **52**, 4988 (25 March 1958)

The m.p., absorption spectrum and dyeing properties on acetate, Vinyon and nylon 6 of 37 monoazo disperse dyes of the type—



(X and Y = H, NO_2 , Cl; R^1 and R^2 = Alk, hydroxyalkyl or β -cyanoethyl) are recorded.
E.S.

Azo and Mercurated Azo Derivatives of some 2-Aminothiazoles

G. N. Mahapatra

J. Indian Chem. Soc., **34**, 901-905 (Dec. 1957)

4-Aryl-2-aminothiazoles, where aryl is phenyl and its alkyl, alkoxy, amino halogeno and hydroxy derivative, naphthyl, 2-thienyl, or phenylethyl and its 4-methoxy derivative, has been coupled with diazotised sulph-anilimide and its 3-acetoxymercuric compound to give the corresponding 5-azo compounds. The presence of the sulphamylphenylazo group has little effect on the antibacterial properties of the thiazole group, but the products show the maximum fungitoxic activities.
C.H.R.

Phenoxazine Dyes

A. B. Sen and R. C. Sharma

J. Indian Chem. Soc., **34**, 877-881 (Dec. 1957)

The diphenylamine compounds, obtained by condensing alkyl and alkylcarboxy derivatives of 2,4-dinitrochlorobenzene with 2-aminophenol and its 4-methyl derivative,

on treating with alkali give the corresponding 1- and 3-nitrophenoxazines. These have been reduced catalytically to the amino compounds.
C.H.R.

Formation of Azine Dyes in Colour Development. I—Dependence of the Reactivity of Derivatives of 1:3-Phenylenediamine on the Structure under the Conditions of Colour Development

I. V. Aleksandrov

Zhur. Nauch. i Priklad. Fot. i Kinematog., **2**, 191-197 (1957);
Chem. Abs., **52**, 4363 (25 March 1958)

Positive film was exposed in a sensitometer and developed for 10 min. (except where otherwise stated) in a diethyl-p-phenylenediamine colour developer of given composition, the colour-forming component being varied as follows—1:3-phenylenediamine (I), 2:4-diaminotoluene (II), 3:5-diaminotoluene (III), 3:5-diamino-1:2-xylene (IV), 2:6-diamino-1:4-xylene (V), 3:5-diaminopseudocumene (VI), 3-(p-tolylsulphonamido)-aniline (VII), 4-(p-tolylsulphonamido)-2-toluidine (VIII), 2-(p-tolylsulphonamido)-4-toluidine (IX), 1:3-bis(phenylsulphonamido)benzene (X), 1:3-bis(p-tolylsulphonamido)benzene (XI), 2:4-bis(p-tolylsulphonamido)toluene (XII), 3:5-bis(p-tolylsulphonamido)-1:2-xylene (XIII). After clearing, the maximum optical density of the resulting dye and the wavelength of its spectral absorption maximum (λ) were measured. For the dyes as formed from the above components they are—I very low (90 hr. development), —; II very low (72 hr. development), —; III very low, —; IV low, —; V very low, —; VI very low, —; VII 0.10, 496; VIII 0.31, 504; IX very low, —; X 0.29, 503; XI 0.32, 505; XII 0.91, 515; XIII 1.35, 525. Similar data is given for dyes where the colour-forming components were nondiffusing acylaminoarylsulphonyl derivatives of I and IV. Introduction of arylsulphonyl radicals into the amino groups of I and its derivatives sharply increases their reactivity. Introduction of the CH_3 group at the 2-position of substituted 1:3-phenylenediamines sharply decreases their reactivity, apparently because of steric hindrance.
C.O.C.

Cyanine Sensitising Dyes (a Review)

C. E. K. Mees

Bull. Research Council Israel, **5C**, 289-298 (1957)

Carotenoid Pigments. II—Structure of Capsanthin and of Capsorubin

L. Cholnoky, D. Szabó and J. Szabolcs

Ann., **606**, 194-208 (1957);
Chem. Abs., **52**, 3741 (10 March 1958)

Evidence which shows that the empirical formula of capsanthin is $\text{C}_{46}\text{H}_{58}\text{O}_3$ (instead of the hitherto accepted $\text{C}_{46}\text{H}_{56}\text{O}_3$) and of capsorubin $\text{C}_{48}\text{H}_{58}\text{O}_4$ (not $\text{C}_{48}\text{H}_{56}\text{O}_4$ as previously stated). 22 references.
C.O.C.

Structure of Orcein Dyes

H. Musso, H. G. Matthies, H. Beecken, and H. Krämer

Angew. Chem., **69**, 178 (1957)

Autoxidation of orcein in NH_4OH led to 12 components which were separated by chromatography on cellulose (butanol-phosphate buffer, pH 11.75). Structures of 6 of these components are suggested.
C.O.C.

Structure of Mangostin

F. Yates and G. H. Stout

J. Amer. Chem. Soc., **80**, 1691-1700 (5 April 1958)

Mangostin, the bright yellow colorant obtained from various parts of the mangosteen tree, *Garcinia mangostana*, *Guttiferaceae*, is shown to be 1:3:6-trihydroxy-7-methoxy-2:8-di-(3-methyl-2-butenyl)-xanthone.
C.O.C.

Glaukonite—A Green Pigment as Substitute for Chromium Oxide

E. K. Landra, O. Y. Pardane, N. K. Polikarpov, and A. E. Ritso

Khim. Prom., (3), 19-21 (1953);
Referat Zhur., *Khim. Abstr.* No. 27251 (1956);
Chem. Abs., **52**, 4205 (10 March 1958)

Glaukonite, produced from the glaukonite sands from the N. Estonian coast, can replace the expensive chromium oxide and the unstable Zn and Pb green pigments. The mineral is ground, treated with a magnetic separator, and again ground with air separation. It is fast to light and suitable for both outdoor and indoor use.
C.O.C.

Iron-Zinc Red Pigments

M. Kranz

Przemysl Chem., 13, 458-462 (1957)

Red pigments were obtained by precipitating an aqueous solution of ferric and zinc sulphates with caustic soda. The best pigments were obtained when a concentrated solution of the sulphates was used and the caustic soda in less than stoichiometric amount was added quickly. The precipitate was calcined for 5 min. at 800°C. without being washed. The products are intensely coloured and so can be let down with white extenders.

C.O.C.

PATENTS

Aromatic Sulphonium Compounds—Intermediates for Dyes, Pigments, Textile Auxiliary Agents and as Paint Additives

FBy

BP 794,066

Good yields of sulphonium compounds are obtained by treating a phenol substituted in at least the 2- and 6-positions by Hal and/or Alk with thionyl chloride in presence of a Friedel-Crafts catalyst at $\geq 30^\circ\text{C}$. The products are intermediates for dyes and auxiliary agents. With acid dyes they form insoluble salts which can be used as pigments. They can be incorporated into bentonite to yield products having similar properties to bentonites containing quaternary ammonium compounds and can be used as paint additives.

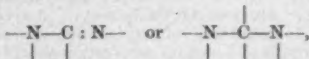
C.O.C.

Condensates of Styrene Oxide with Ureas or Thioureas—Textile Auxiliary Agents and Intermediates for Dyes

Deutsche Gold- und Silber-Scheideanstalt

BP 794,645

Condensates of styrene oxide with compounds containing the group—



e.g. urea, melamine and dicyandiamide, are used as intermediates for dyes, azoic coupling components and textile auxiliary products.

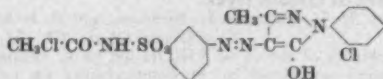
C.O.C.

Monoazo Acid Dyes having an N-(Halogenoacyl)-sulphonamide Group

Ciba

BP 793,532

The sulphonamide group of monoazo (especially pyrazolone) dyes is N-acylated with an acid halide or anhydride derived from a fatty acid having an α - or β -halogen atom. The products dye wool from weakly acid, neutral, or weakly alkaline baths, and are faster to washing than similar dyes having a N-acylsulphonamide group not containing the α - or β -halogen atom. Thus the monoazo compound metanilamide \rightarrow 1-o-chlorophenyl-3-methyl-5-pyrazolone dissolved in dioxane is treated cold with chloroacetyl chloride in presence of NaOH to give the yellow dye—



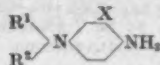
E.S.

Red Metallisable Disperse Monoazo Dyes

ICI

BP 794,059

Red disperse dyes which may be aftertreated with metal (especially copper) compounds are made by diazotising an amine—



(X = H, Alk, and O Alk; R¹ = H, Alk or hydroxyalkyl; R² = Alk, hydroxyalkyl, or subst. or unsubst. phenyl) and coupling with 8-hydroxyquinoline (I). Thus *p*-amino-*NN*-diethylaniline is diazotised and coupled with I in presence of β -ethoxyethanol, and aq. NaOH and Na₂CO₃. The monoazo compound so formed is applied as a dispersion to cellulose esters or nylon and aftertreated with Cu salts.

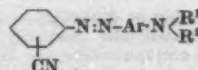
E.S.

Disperse Monoazo Dyes from Cyanoanilines

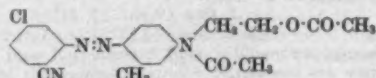
FBy

BP 794,135

Cyanoanilines are diazotised and coupled with suitable aromatic amines to give disperse dyes—



(Ar = radical of benzene or naphthalene series; R¹ = H, Alk, hydroxyalkyl (I) of 1-4 C, or acylated I; I may form a ring by attachment to Ar; R² = H or acyl; NR¹R² is *para* to the azo link; the ring containing CN may contain Alk, Hal or further CN groups; SO₂ and COOH groups must be absent) which give oranges to blues of similar shade and fastness on both cellulose acetate and nylon. Thus 5-chloro-2-cyanoaniline is diazotised and coupled with *N*-hydroxyethyl-*m*-toluidine to give an orange. Treatment of this dye with boiling acetic anhydride gives—



which is also an orange.

E.S.

Metal(Chromium)-complex Monoazo Dyes for Wool, Nylon, etc.

S

BP 794,053

Monoazo compounds $x\text{-R}^1\text{-N:N-R}^2\text{-y}$ (R¹ = Ar of benzene series; x = OH or COOH; R² = naphthalene series radical; y = secondary amino group; x and y are *ortho* to the azo link) free of SO₂H groups, but containing an alkylsulphonyl or sulphonamide group, are converted into 1:2 chromium complexes, which dye wool and nylon brown, olive or grey from neutral or weakly acid baths. Or a mixture of such a monoazo compound with an *oo'*-dihydroxy- or *o*-carboxy-*o'*-hydroxymonoazo compound is chromed to give similar dyes. Thus the monoazo compound 2-aminophenol-4-sulphonamide \rightarrow *N*-*m*-chloro-phenyl-2-naphthylamine is stirred at 100°C. in formamide with chromium ammonium sulphate to give a grey.

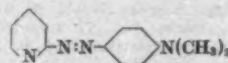
E.S.

Quaternary Ammonium Salts of Monoazo Compounds—Basic Dyes for Polyacrylonitrile, etc.

Gy

BP 793,587

Alkylation of monoazo compounds Py-N:N-B (Py = mono- or poly-nuclear pyridine residue bound to the azo group by a C atom of the pyridine ring; B = residue of coupling component, especially an *NN*-dialkylaniline) gives quaternary ammonium compounds which are basic dyes for polyacrylonitrile fibres. Thus 2-aminopyridine is boiled in toluene with sodamide to give the Na salt, which is condensed with *p*-nitroso-*NN*-dimethylaniline to give the azo compound—



Boiling in tetrachlorethane with dimethyl sulphate gives the quaternary ammonium compound, which is converted into the ZnCl₂ double salt. It dyes polyacrylonitrile, mordanted cotton, and silk violet from acetic acid baths.

E.S.

1:2 Metal(Chromium)-complex Dyes for Wool, Nylon, etc. from *o*-Alkoxy-*o'*-hydroxyazo Compounds

BASF

BP 793,136

o-Alkoxy-*o'*-hydroxyazo compounds readily yield 1:2 chromium-dye complexes by heating with a hexavalent Cr compound in presence of an organic solvent whilst reducing the Cr compound; preferably the solvent itself is capable of bringing about the desired reduction. The products dye wool, nylon, etc. from neutral or weakly acid baths. Thus the monoazo compound 3-amino-4-methoxy-toluene-6-sulphonamide \rightarrow 3-methyl-1-phenyl-5-pyrazolone is heated to 120°C. in diethylene glycol, powdered Na₂Cr₂O₇ is added slowly, and heating continued for 6 hr. at 130-135°C. The product dyes wool red.

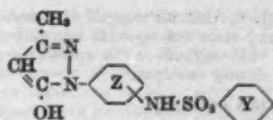
E.S.

Yellow to Brown Metal(Cobalt)-complex Monoazo Pyrazolone Dyes for Wool, Nylon, etc.

ICI

BP 793,712

The monoazo dyes obtained by coupling a diazotised *o*-aminophenol (which may contain Hal, NO₂, CH₃, or OCH₃ groups) with a pyrazolone—



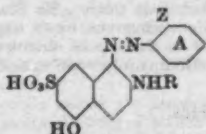
(nucleus 'Y may contain Hal, CH₃, OAlk, acylamino; nucleus Z may contain CH₃, as substituents) are made into 1:2 cobalt-dye complexes which dye wool and nylon from neutral or weakly acid baths, and may also be used for colouring lacquers, etc. Thus 2-amino-4-nitrophenol is diazotised and coupled with 1-[3'-(4"-methylphenylsulphonyl)aminophenyl]-3-methyl-5-pyrazolone and the monoazo compound so formed refluxed in aq. ethylene glycol with cobaltous acetate. The cobalt complex so formed dyes wool orange from a neutral bath. E.S.

Blue, Metal(Copper)-complex Disazo Direct Dyes
BP 792-734

The copper-complexes of diazo dyes made by coupling tetrazotised dianisidine with 1 mol. of 2-benzoylamino-5-naphthol-1:7-disulphonic acid and 1 mol. of a 1-naphthol-disulphonic acid are blue and navy blue direct dyes. Thus 1-naphthol-3:6-disulphonic acid gives a navy blue.

Grey and Black Trisazo Direct Dyes for After-coppering
8 RP 793 080

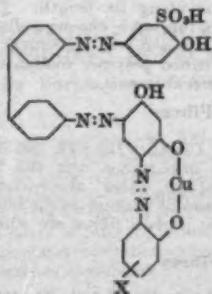
Dyes similar to those of BP 760,705 (J.S.D.C., 73, 67 (1957)) are obtained by coupling a tetrazotised benzidine having chelatable groups in the 3:3'-positions with 1 mol. of a monoazo compound—



(R = H, Alk, aryl, etc.; A may contain substituents; Z = OH or COOH) and with 1 mol. of an *ortho*-coupling keto-enol compound instead of the phenol or naphthol specified in BP 760,705. The use of mixtures of two such keto-enol compounds gives interesting dyes. Thus benzidine-3,3'-dicarboxylic acid is tetraxetized and coupled, first with 1 mol. of the acid-coupled monoazo compound 2-aminophenol-4-sulphonamide \rightarrow *N*-phenyl-J acid, and then with a mixture of acetacetanilide and 3-methyl-1-phenyl-5-pyrazolone. The product dyes cellulose black by the single- or two-bath coppering process. Examples of 47 dyes are given. E.S.

Brown Metal(Copper)-complex Trisazo Direct Dyes
FBy BP 793,495

The copper-complex trisazo dyes made by coupling tetrazotised benzidine with 1 mol. of phenol-*o*-sulphonic acid (I) and 1 mol. of the Cu complex of a monoazo compound *o*-aminophenol (or its SO₃H or COOH derivatives) → resorcinol, viz.—

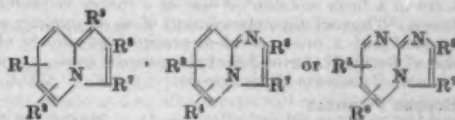


(X = H, SO₃H, or COOH) have good fastness to alkali, and do not precipitate in hard water as do the dyes of GP 871,591 in which salicylic acid is used in place of I.

Fluorescent Brightening Agents

Compounds of formula—

USP 2,785,133



(R¹ = H, Hal, acyl, Alk, Ar, aralkyl, acylamino or alkenyl; R² = H or Alk of same value as R¹; R³ = H, Alk, alkoxy, Hal, Ar; R⁴ = H, Alk, Hal of the same value as in R¹, aminoalkyl; R⁵ = H, Alk, alkoxy, Ar or Hal of same value as in R¹; R⁶ = H, Hal, hydroxy, Alk, alkoxy, carballoxy, sulphanilyl or aminophenylmercapto; R⁷ = H, Alk, acyl, Ar or aralkyl of same value as in R¹, carballoxy or heterocyclic; R⁸ = subst. or unsubst. Ar, or heterocyclic; R⁹ = Alk, acyl, Ar or aralkyl of same value as in R¹ or carballoxy), e.g. 2-phenylpyrrocoline, 2-phenylpyrimidazole, 2-phenylimidazo[1,2-a]pyrimidine, 2:3-diphenylpyrrocoline and 2-phenyl-6-ethylpyrrocoline, are fluorescent brightening agents having excellent affinity for protein fibres, acetate rayon, nylon and other synthetic fibres. C.O.C.

Surface-treated American Process Zinc Oxide

American Zinc, Lead and Smelting Co. USP 2,785,990

Zinc oxide (C.I. 77947) is more speedily incorporated into rubber if 0.2-1.0% of zinc propionate is added to the pigment which is then milled, screened and heated, if necessary, at 140-300°C. This results in the pigment particles being coated with basic zinc propionate.

Red Oxide of Iron (C.I. Pigment Red 101)

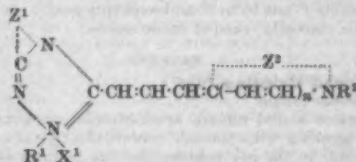
C. K. Williams & Co.

When colloidal iron oxide seed is formed by treating an aqueous iron salt with close to its combining proportions of alkali the product obtained by further processing or maturing by growth of particles is not yellow but red. X-Ray examination shows that the pigment obtained has the hematite or hydrohematite structure. C.O.C.

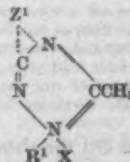
Cyanine Dyes from Triazolo Bases

Eastman Kodak Co.

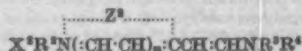
Dyes of formula—



(R¹ and R² = Alk; m = 0 or 1; X¹ = acid radical; Z¹ = atoms to complete a nucleus of the benzothiazole or quinoline series; Z² = atoms to complete a 5- or 6-membered ring) are obtained by condensing a compound of formula—



with one of formula—



(X^2 = acid radical; R^3 = acyl; R^4 = Ar) in presence of a basic condensing agent. Thus the deep yellow 3-ethoxy-2-methoxy-4-(1'-*o*-triazolo[4,3-*a*]quinoxalocarbonyl)iodide is obtained by condensing 1,2-dimethyl-5-triazolo[4,3-*a*]quinoxinium iodide with 2-*p*-acetanilidovinylbenzoxazole etholinolide in pyridine in presence of triethylamine.

Aluminium Silicate as Rubber Pigment

Colombia-Southern Chemical Corpn. *USP* 2,786,776

Various methods are described for preparing aluminium silicate in a form suitable for use as a rubber reinforcing pigment. Thus an aqueous solution of an aluminium salt is treated with a finely divided, precipitated silicate of a metal of Group II, series 3-8 of the periodic table, e.g. aq. $AlCl_3$ with Ca silicate of particle size $< 0.1 \mu$. C.O.C.

Siliceous Pigment

Colombia-Southern Chemical Corpn. *USP* 2,786,777

Finely divided Ca silicate is treated with aq. Al sulphate. The product is a pigment suitable for use in prints, ink, paper, and rubber. C.O.C.

Carbon Black (C.I. Pigment Black 7) (I p. 557)

Coating Fabric, Pigments etc., with Pyrolysed *p*-Xylene or Substituted *p*-Xylene (X p. 536)

V—PAINTS; ENAMELS; INKS**Pigment-Vehicle Interface**

A. C. Zettlemoyer

Am. Ink Maker, 35 (12) 43, 81 (1957);

Chem. Abs., 52, 5851 (10 April 1958)

A review of pigment-vehicle interfacial phenomena in printing inks. C.O.C.

Rate of Sedimentation in Concentrated Pigment Suspensions

L. Dintenfuss

Chem. and Ind., 98-99 (25 Jan. 1958)

The following equation has been developed and proved to be of value for highly flocculated or highly concentrated pigment suspensions, which fall outside Stokes's law—

$$Q = V_s(1-F)^{2.10-1.82F}$$

where Q = rate of settling, F = sedimentation volume, as a fraction of the original volume, and V_s = velocity of sedimentation of a single particle by Stokes's law. With absolute dispersed suspensions the value of F can be estimated from the equation—

$$\log \eta_r = \frac{F}{1-F}$$

(η_r = ratio in kinematic units, of viscosity of suspension to viscosity of vehicle). With flocculated (thixotropic) suspensions F has to be found experimentally, or estimated from the viscosity-rate of shear curve. W.K.R.

PATENTS**Dye Toned Printing Inks**

J. M. Huber Corpn.

USP 2,785,079

Intensive toned effects are obtained without the dye used migrating with the ink vehicle if a dye is used which is insoluble in the ink vehicle, the dye being dissolved in a solvent which is soluble in the ink vehicle. Thus a carbon black ink having mineral oil as vehicle was toned by adding Methyl Violet (C.I. Basic Violet 1) dissolved in isopropanol. C.O.C.

Writing Ink

W. A. Sheaffer Pen Co.

BP 794,601

An aqueous solution of a dye having no affinity for paper and a colourless fluorescent substance substantive to paper which substance becomes visible by its fluorescence in ultraviolet radiation, provides a writing ink which may be washed out but leaves behind an invisible residue which becomes visible in ultraviolet radiation. C.O.C.

Styrenated Glyceride Oil Emulsions

Glidden Co.

BP 778,237

Surface coating emulsions whose disperse phase is not absorbed into porous surfaces are prepared by conventional emulsion copolymerisation of a heat-treated drying or semi-drying oil (20-95%) of viscosity > 150 poise, e.g. bodied linseed oil, and a vinyl monomer (80-5%), e.g. styrene. E.C.

Coating Compositions

Canadian Industries

BP 777,769

Coating compositions for stoved finishes with improved flexibility and resistance to soap and to yellowing are prepared by mixing a copolymer of styrene (15-80%), an alkyl acrylate (15-80%), and acrylic acid (5-10%) with

from one sixth to half its weight of a low mol.wt. conventional epoxy-resin (of epoxide content $> 7.5\%$) and 0.5-2.0% of the mixture of a quaternary ammonium hydroxide as curing catalyst. E.C.

Alkyl Titanate Coatings

DuP

BP 777,584

Hard, transparent, scratch-resistant coatings of high gloss, suitable as priming or finishing coats for glass, ceramics, metals, cellulosic films, synthetic fibres and plastic sheets are prepared from an alkoxide (C_1-C_8) of a metal of Gp. IV, e.g. butyl titanate. The coatings, which should be $< 1 \mu$ thick per coat, are applied from solvent solution and are developed by exposure to moist air. E.C.

Polyvinyl Acetate Emulsions Stabilised with Hydroxyethyl Cellulose (III p. 557)

Aromatic Sulphonium Compounds—Intermediates for Dyes, Pigments, Textile Auxiliary Agents and as Paint Additives (IV p. 560)

VI—FIBRES; YARNS; FABRICS**Fifty Years of Chemical Progress in Textiles**

E. M. Buras and M. Harris

Ind. Eng. Chem., 50, 97A-101A (Jan. 1958)

A historical account of the major developments in chemicals used in finishing and of the introduction and progress of the regenerated and synthetic fibres. W.K.R.

Annual Review—Textiles 1957

J. F. Krasny and M. Harris

Ind. Eng. Chem., 50, 38A-40A (Jan. 1958)

A brief review covering the more important developments during 1957 in the use of chemicals in the textile industry, with particular reference to new fibres, dyes, and finishes. W.K.R.

Non-woven Fabrics

A. Buzelin

Textex, 23, 245-263 (15 April 1958)

The methods are considered under the headings—preparation of the fibrous mat, bonding, finishing. Suggested domestic and industrial uses are listed. S.R.C.

Laminar Structure and Textile Fibres

G. Centola

Textex, 23, 177-193 (15 March 1958)

Lateral anisotropy is as important in completely synthetic fibres as in native cellulose. In the former also the structural material tends to order itself in accordance with the laminar zones. This is considered in relation to the degree of crystallinity. Lamellar ribbon networks in macropolymers and the cold drawing of polyamides are also discussed. S.R.C.

Fringed Fibril Theory of Structure in Crystalline Polymers

J. W. S. Hearle

J. Polymer Sci., 28, 432-435 (March 1958)

Crystalline regions are regarded as continuous fringed fibrils composed of molecules diverging from the fibril at different positions along its length. This structure is suggested as being formed in the crystallisation of a rayon filament as it is spun and is in agreement with crystallisation in more extended polymer masses and with certain experimental observations. W.R.M.

New Wool-like Fibres

D. Traill

Chim. et Ind., 79, 290-301 (March 1958)

The economic importance and the tensile strength, elasticity, flexibility, water absorption, and thermal insulation properties of various textile fibres are discussed. Possible synthetic protein fibres are considered. W.R.M.

Formation of Fibres

H. Batzer

Chem. and Ind., 16, 458 (19 April 1958)

Brief report of a lecture. Characteristics of fibre-forming polymers are summarised. Size of molecules and a high degree of symmetry of both monomer and polymer are particularly important. W.R.M.

Dynamic Mechanical Properties of 6,6-Nylon

J. M. R. Quistwater and B. A. Dunell

J. Polymer Sci., **28**, 309-318 (March 1958)

The dynamic tensile modulus and energy loss of 6,6-nylon have been measured at 35°C. over a wide range of humidity. Dispersion of mechanical properties is observed with changing humidity, a maximum in loss factor occurring at 70% R.H. Increase in the amount of water adsorbed leads to plasticisation of the fibre and consequent increase in motion of chain segments in amorphous regions.

W.R.M.

Hydrogen Bonding in Polyamides and Polyurethanes

D. S. Trifan and J. F. Torenzi

J. Polymer Sci., **28**, 443-445 (March 1958)

Infrared absorption measurements suggest essentially complete hydrogen bonding in both crystalline and amorphous regions at room temperature. At higher temperatures the amount of non-bonded NH increases, and for 6-8 polyurethane it is 15% at 175°C.

W.R.M.

Transition of Polyethylene Terephthalate Fibre Birefringence

S. Sakajiri

J. Polymer Sci., **28**, 452-453 (March 1958)

The birefringence of oriented and unoriented fibres of polyethylene terephthalate decreases with increasing temperature and changes from positive to negative at the second-order transition temperature of approx. 80°C.

W.R.M.

Effects of Acids on Terylene

E. Furrer

Textil-Rund., **13**, 129-153 (March 1958)

Saponification was measured by conductimetric titration of the freed carboxyl groups and serviceability by tensile strength and elongation at break. H_2SO_4 , HCl, and HNO_3 damage Terylene considerably at relatively high concentrations and temperatures, whilst, under the same conditions H_2F_4 , H_3PO_4 , CH_3COOH and $(COOH)_2$ have little or no effect.

Elongation—Tensile values are greater for HNO_3 than for HCl or H_2SO_4 at equal levels of attack.

At the same average D.P. H_2SO_4 -damaged fibre is stronger than HCl- and HNO_3 -damaged. The different diffusion rates of these acids under equal conditions result in surface attack with H_2SO_4 but penetration by HCl and HNO_3 . Water absorption, m.pt. and X-ray diffraction are hardly affected by acid damage. Cibacot Diazo Black B (Ciba) detects traces of acid without indicating possible degradation.

S.R.C.

Discoloration Effects in Polyacrylonitrile Fibres

J. Schurz

J. Polymer Sci., **28**, 438-439 (March 1958)

A possible mechanism for the discoloration of polyacrylonitrile on heating and treatment with bases is suggested, involving formation of azomethine cross-links between neighbouring chains.

W.R.M.

Insolubilised Cellulose Ethers (III p. 558)

Effects of Dyeing on the Permanent Set of Wool. II—

Effects of Acid Mordant Dyes (VIII this page)

Acilan and Acilan 16 (VIII p. 564)

VII—DESIZING; SCOURING; CARBONISING; BLEACHING**Heats of Micelle Formation of Sodium Dodecyl Sulphate**

H. Matijevic and B. A. Pethica

Trans. Faraday Soc., **54**, 597-592 (April 1958)

Critical micelle concentrations have been measured at 20, 40, and 60°C. in three different NaCl concentrations. The results are compared with values obtained by other methods. An equation of the Clausius-Clapeyron type is used to calculate heats of micelle formation. The limitations of this equation and other thermodynamic treatments of micelle formation are considered.

W.R.M.

Washing Problems in the Synthetic Fibres Industry

J. E. Grew and P. K. Williamson

Chem. and Ind., 78-83 (25 Jan. 1958)

An account is given of problems involved in washing viscose rayon immediately after spinning to remove

entrained chemicals from the coagulation bath. Theoretical principles are discussed and related to the practical methods now used.

W.K.R.

PATENTS**Steam-bleaching of Cotton with Hydrogen Peroxide**

Food Machinery & Chemical Corp.

BP 793,733

The goods are impregnated with 60-125% of their weight of alkaline hydrogen peroxide using as stabiliser a tri-polyphosphate and an alkali metal salt of ethylene diamine tetra-acetic acid in absence of a soluble silicate, and then steamed. Thus cotton sheeting was impregnated with its own weight of solution containing 0.8% H_2O_2 , 35%, 0.1% NaOH, 0.8% Na tripolyphosphate, and 0.05% Na salt of ethylene diamine tetra-acetic acid, steamed for 1 hr. and washed. The treated goods were whiter and had a lower fluidity value than goods similarly treated in absence of the sequestering agent.

C.O.C.

Bleaching of Cotton Cloth

DuP

BP 793,757

The cloth is wet out in an aqueous solution containing a wetting agent and a phosphate, rinsed and bleached with alkaline hydrogen peroxide. This enables the cloth to be satisfactorily bleached with the use of only one J-box in a continuous process.

C.O.C.

Bleaching Kraft Pulp

DuP

USP 2,779,656

A multistage process employing active chlorine agents includes an intermediate caustic extraction treatment prior to the final hypochlorite bleaching stage. The alkaline extracting liquor contains a peroxygen compound and has a total alkali content of 1.0 to 2.2% calculated as NaOH and based upon the dry weight of the pulp. At least 60% of the total alkalinity is derived from alkali metal hydroxides and alkali metal peroxides. Hydrogen peroxide or any equivalent peroxygen compound, e.g. alkali metal peroxides, perborates, perphosphates, percarbonates, etc., can be used.

R.A.

Acilan and Acilan 16 (VIII p. 564)

VIII—DYEING**Effects of Dyeing on the Permanent Set of Wool.****II—Effects of Acid Mordant Dyes**

S. Okajima and K. Kikuchi

Sen-i-Gakkaishi, **13**, 170-174 (1957);*Chem. Abs.*, **52**, 5830 (10 April 1958)

Neolan Brown GRM (structure unknown) slightly decreased the setting ability of wool while Chrome Brown RH (C.I.13250) and Eriochrome Azurol B (C.I.43820) with a mordant [$K_2Cr_2O_7$; $Cr_2(SO_4)_3$ far less effective] decreased it more. Here no desorption of dyes was observed during the setting. The fastness of mordant dyes seems to be a result of the formation of linkages between the NH_2 group of the keratin and a metal atom (Cr) which bind the keratin and dye molecules together.

C.O.C.

High-temperature Dyeing

J. J. Innarone

Canadian Textile J., **74**, 47-55 (27 Dec. 1957)

The advantages obtained by dyeing hydrophobic fibres, e.g. Dacron, nylon, Orlon, cellulose triacetate, at temp. above the boil are reviewed, and the dyeing of wool, cotton, and rayon at high temp. is also discussed. The maximum safe dyeing temp. for each fibre is stated and some typical recipes are provided. The scope of the Thermosol, fluid bed, molten urea and high temp. solvent methods of achieving high dyeing temp. is discussed and machinery developed for pressure dyeing is described briefly. An appendix lists du Pont dyes which are suitable for use in the various procedures.

W.K.R.

Dyeing of Rilsan

A. Würz

Teintex, **23**, 163-175 (15 March 1958)

The constitution, manufacture and dyeing properties are discussed. Continuous filament must be dyed with disperse dyes to avoid bairiness, but staple fibre can be dyed in light shades with disperse, acid, chrome, and pre-metallised dyes, some of which may be employed for medium and full shades. For navy and black high-temperature dyeing with selected 1:2 pre-metallised dyes is recommended. Numbers of the latter class give uniform shades on wool-Rilsan.

S.R.C.

Acrilan and Acrilan 16

S.V.F. Fachorgan, 13, 108-180 (March 1958)
The issue includes papers on physical and chemical properties, uses, chlorite bleaching, dyeing of 100% Acrilan and mixtures with wool or cellulose fibre, the Chem-Acrl process, and the properties of Acrilan 16. Acrilan 16 is whiter than normal Acrilan, of irregular cross-section, and of similar physical properties, but it can be dyed only with basic and disperse dyes. S.R.C.

Two-colour Effects on Acrilan

W. H. Hindle

Dyer, 119, 399-400 (14 March 1958)
A review of the dyeing behaviour of Acrilan and Acrilan 16. Two-colour or colour-and-white effects can be obtained with mixtures of Acrilan and Acrilan 16 by utilising the selective affinity of Acrilan for acid dyes and the greater affinity of Acrilan 16 over Acrilan for basic dyes. In mixtures with cellulosic rayons, three-colour effects can be obtained. A.J.

Isoelectric Measurements of Electrolyte Activity. Sky Blue FF (C.I. Direct Blue 1) and Sodium Polymethacrylate

S. Chadwick and S. M. Neale

J. Polymer Sci., 28, 355-358 (March 1958)
Isoelectric measurements have been made on aqueous solutions of Sky Blue FF and sodium polymethacrylate. Relevant activity coefficients are estimated. W.R.M.

Fur Dyeing with Vat Dyes

N. I. Goland and E. M. Metelkina

Legkaya Prom., 16 (5), 30, 31 (1956);
Chem. Abs., 52, 4990 (25 March 1958)
Certain vat dyes can be applied to furs if the pH is continuously kept under control. Recipes are given in which the pH at the start of dyeing is 9.75 and at the end 9.3-9.4. C.O.C.

PATENTS**Continuous Dyeing with Vat or Sulphur Dyes**

Standfast Dyers & Printers

BP 793,190
The material is impregnated with an aqueous liquor at $\geq 25^\circ\text{C}$. containing the dye, thiourea dioxide or a mixture of thiourea and an oxidising agent, and an alkali solvent for the dye. The components of the liquor are brought together immediately before the impregnation. The impregnated material is then heated to $\leq 70^\circ\text{C}$. This gives thorough penetration even with thick fabrics and avoids tailing. C.O.C.

Ingrain or Mélange Effects in Wool Dyeing

Maifoss

BP 793,515
Modification of *BP* 680,862 and 740,003 (J.S.D.C., 69, 36 (Jan. 1953) and 72, 38 (Jan. 1956)). Dyes containing one sulphonie acid group and at least one carboxyl group or pre-metallised (chrome) dyes containing one sulphonie group in the complex are applicable by the processes described if the bath at the beginning of dyeing has pH < 4.4 .

BP 793,516
Wool (other than mixtures of chlorinated and non-chlorinated wool) is dyed in a bath which at the start has pH ≥ 5.5 and contains (a) acetic acid, HCl, HCOOH, phosphoric or lactic acid or an ammonium salt thereof, (b) a direct dye containing ≥ 2 sulphonie acid groups in the molecule and, if desired, (c) other dyes containing 1 or no sulphonie acid group in the molecule, e.g. acid or premetallised acid dyes. C.O.C.

Dyeing Protein, Polyamide or Polyurethane Fibres

BASF *BP* 793,903

Dyeings of improved colour value and fastness properties are obtained with 1:1-chromium complex azo or azomethine dyes containing no sulphonie acid group if dyeing is carried out in presence of a colourless organic compound which is itself capable of forming a complex chromium compound. Alternatively, dyeings with these dyes are aftertreated with compounds of this type. The preferred agent is 2-hydroxybenzoic acid-5-sulphonie acid phenylamide. C.O.C.

Union Dyeing of Blends of Polyacrylonitrile Fibres and Basic Nitrogenous Fibres

Chemstrand Corp.

BP 793,117
Blends of fibres made up of a polymer $\leq 80\%$ acrylonitrile and 2-10% vinyl pyridine with basic nitrogenous fibres, e.g. wool, are readily dyed solid with acid and

mordant dyes in presence of a cationic surface active agent. With mordant and pre-metallised acid dyes it is necessary also to have present a non-ionic surface active agent to prevent formation of seam with its consequent streaky or uneven dyeings. C.O.C.

Dyeing Cellulose Triacetate with Azoic Dyes

BrC

BP 792,838
The material is treated with an azoic diazo component in an aqueous bath at pH > 6 then with 2:3-hydroxy-naphthoic acid in an aqueous bath at pH < 4 and finally diazotised to effect coupling of the two components. By using *p*-aminobenzene-azo- α -naphthylamine as the azoic diazo component highly satisfactory blacks may be obtained. C.O.C.

Azoic Dyeing of Cellulose Triacetate

BrC

BP 793,559
Absorption of enolic coupling components from aqueous bath by cellulose triacetate is greatly facilitated by use of water-insoluble organic substances, particularly such as are solvents for the coupling component and are compatible with or even solvents for the cellulose triacetate. Diethyl phthalate is particularly valuable for this purpose. Thus, if cellulose triacetate is treated for 1 hr. at 98-100°C. in a neutral 40:1 bath containing 2% (on weight of the cellulose triacetate) of C.I. Azoic Coupling Component 19 and 4 g./l. of diethyl phthalate the amount of component absorbed is about twice that taken up in absence of diethyl phthalate. C.O.C.

Dyeing and Finishing Frieze and Pile Fabrics containing Man-made Fibres

Collins & Aikman Corp.

USP 2,785,042
Apparatus for the continuous dyeing of frieze and pile fabrics containing man-made fibres without deforming the pile or marring the face of the fabrics. Dyeing is done cold and is followed by steaming. At no time while the fabric is hot is its pile or face pressed against a roller or other smooth surfaced element thus obviating any compression of the fibres while they are hot. C.O.C.

Fifty Years of Chemical Progress in Textiles (VI p. 562)
Annual Review—Textiles 1957 (VI p. 562)

IX—PRINTING**PATENTS****Printing with Azoic Compositions**

CFM

USP 2,786,731
Pastes containing an azoic coupling component, a diazoamino compound containing water-solubilising groups in the residue which takes no part in dye formation, an alkali and $\alpha\alpha'$ -dichloroadipic acid have outstanding stability at room temperature and when printed onto textiles and neutral steamed yield prints of intense and pure colour. C.O.C.

Printing with Onium Dyes

ICI

BP 793,566
When printing with dyes containing isothiuronium salt groups attached through methylene linkages to aromatic nuclei, especially when used as stable compositions as described in *BP* 707,557 (J.S.D.C., 70, 312 (July 1954)) better results are obtained under the conditions described in *BP* 686,036 (J.S.D.C., 69, 132 (April 1953)) if glutaric acid is used as the organic acid. C.O.C.

Colour Line Rasters

Emimeta Fabrikations Anstalt

BP 793,085
Colour line rasters as used in additive colour photography are produced by peeling them off from multi-colour laminated blocks. A simple and accurate method of producing such blocks is described. C.O.C.

Formation of Azine Dyes in Colour Development. I—

Dependence of the Reactivity of Derivatives of 1:3-Phenylenediamine on the Structure under the Conditions of Colour Development (IV p. 559)

X—SIZING AND FINISHING**Heat Evolution during the Acetylation of Cotton**

L. H. Greathouse, H. J. Jansson, and C. H. Haydel

Ind. Eng. Chem., 50, 97-102 (Jan. 1958)
Data needed for the control of the process of partial acetylation of cotton was obtained by measuring the heat

evolved in the reaction between cotton cellulose and acetic anhydride in the presence of perchloric acid catalyst. The reaction was carried out in the absence of water to avoid the effect of heat liberated by the hydrolysis of acetic anhydride. The heat evolved amounted to approx. 106 cal. per 1 g. cotton per 1 degree of substitution. The heat is liberated much more slowly with raw than with purified cotton.

W.K.R.

Continuous Cyanoethylation of Cotton Yarns

H. J. Janssen, A. M. Du Pré, C. H. Haydel, J. F. Seal, and H. L. E. Vix

Ind. Eng. Chem., **50**, 76-79 (Jan. 1958)

Cotton yarns are passed continuously through dil. NaOH and then acrylonitrile (or a mixture of the two) and excess impregnant is removed by passing through a heated mercury bath in which the reaction also occurs, and thereafter through an acid rinse bath and dried. To obtain a sufficiently high N content, it is often necessary to pass the yarns through the system two or three times. By-product formation is low and the process permits better utilisation of the acrylonitrile than the conventional method; the treated yarns are also superior in strength and heat resistance.

W.K.R.

Effect of Salts on Cyanoethylation of Cotton

N. M. Bikales, A. H. Gruber, and L. Rapoport

Ind. Eng. Chem., **50**, 87-90 (Jan. 1958)

Cotton can be cyanoethylated more economically by adding to the 2% NaOH pretreatment solution, salts such as sodium thiocyanate and sodium iodide in high concentrations. The rate and extent of the reaction with acrylonitrile is then greatly increased and loss of acrylonitrile in by-product formation is minimised. The effectiveness of these salts is attributed to their swelling action on cellulose. Cotton cyanoethylated in this way is equivalent in properties to that treated by the conventional method.

W.K.R.

Chemically Modifying Cellulose for Flame Resistance

R. F. Schwenker and E. Pacsu

Ind. Eng. Chem., **50**, 91-96 (Jan. 1958)

Flame resistance was imparted to cotton and viscose rayon fabrics by esterifying the cellulose hydroxyl groups with methanesulphonyl chloride, followed by partial replacement with Br and/or I. Glow resistance was also obtained by the further introduction of phosphorus-containing groups. The fabrics increased in weight by about 10% and retained useful textile properties. It is suggested that flame resistance is achieved by preventing or reducing the formation of laevoglucosan during pyrolysis.

W.K.R.

Soil Retention by Textile Fibres

A. S. Weatherburn and C. H. Bayley

Research, **11**, 141-146 (April 1958)

A review of the present state of theory and practice. The soil-retarding finishes which have recently appeared on the market are in general composed of colloidal dispersions of an inert material, e.g. silica or alumina. When they are applied to new or freshly cleaned carpets or upholstery fabrics the particles tend to fill the crevices and other irregularities in the fibres to form smooth surfaces that contain relatively few sites capable of holding soil particles. This type of finish is not permanent although it may be that moderate cleaning methods, e.g. vacuuming, do not remove it. Probably at least some of the soil picked up by fibres is held on their surfaces by forces of attraction. This effect is readily demonstrated on hydrophobic fibres, especially at low R.H., and is usually attributed to "static". Other types of attractive forces may be involved. In any case the condition is one which relates to the energy of the surface or surfaces concerned. It may therefore be speculated that further investigations in this field will include studies of low energy surfaces and ways of producing them.

C.O.C.

Finishing of Woollen and Worsted Fabrics

C. S. Whewell

Annales Scientifiques Textiles Belges,

No. 3, 7-30 (Sept. 1957):

Tint. ind., **35-36**, 7-31 (Jan.-Feb. 1958)

Scouring, setting, milling, raising, drying, decatizing, dimensional stabilisation, shrink-proofing, mothproofing, bleaching, waterproofing and methods for increasing

lustre are shortly discussed. Replies to a number of practical questions are given in the reported discussion.

S.R.C.

PATENTS

Treating Fibres with Dispersions of Silica and a Metallic Oxide

Deutsche Gold- und Silber-Scheideanstalt vormals Roessler
BP 792,624

When treating fibres with a colloidal dispersion of silica addition of a metal oxide, e.g. TiO_2 , ZnO or preferably Al_2O_3 to the dispersion has a synergistic effect in increasing the bonding strength of the oxide particles to the fibres and increasing the friction between the treated fibres. Simultaneously water-repellent properties are imparted to the fibres.

C.O.C.

Applying Substances to a Moving Length of Material

British Cotton Industry Research Assoc.

BP 792,663

Modification of BP 654,178 (J.S.D.C., **67**, 347 (Sept. 1951)). Any change in weight of the liquor in the bath resulting from deviation in the actual rate of application of the liquor from the prescribed rate of application is used to alter some property of the liquor so as to correct the deviation. The liquor contains one or more ingredients dispersed in a cold liquid medium. One at least of these ingredients is ungelatinised but becomes gelatinised when the liquor is heated, the liquor being heated to effect this gelatinisation before it is applied to the material under treatment. At least one of the ingredients of the mixture can, without changing the nature of the other ingredients, impart high enough viscosity to the liquor to keep the dispersion homogeneous. A suitable mixture is sage starch (100), carob-bean flour (4), tallow (8) and water. It can be made up as a powder which forms the starch liquor by being merely stirred into cold water.

C.O.C.

Cyanoethylating Cotton by Treatment with Acrylonitrile Vapour

Institute of Textile Technology

USP 2,786,735

Cotton is impregnated with 0.1-10.0% aq. NaOH so that it absorbs 1.5-22.0 mg. NaOH per g. cotton. Excess liquor is removed and the cotton is treated at 40-85°C. for ≥ 4 hr. with acrylonitrile vapour until it contains 0.5-6.5% of N on the wt. of the treated fibre. This increases affinity for direct and vat dyes and confers affinity for acid and disperse dyes. The mechanical properties are improved as is resistance to rotting.

C.O.C.

Siliconate-Aminoplast Compositions for Imparting Water-repellency, Dimensional Stability and Ability to Recover from Creasing

American Cyanamid Co.

USP 2,785,145

Application of an aqueous solution of a siliconate and an amino resin, followed by drying and curing, imparts a water-repellent finish which is resistant to prolonged laundering and to repeated dry cleaning. In addition, the treated material is dimensionally stable and has good powers of recovery from creasing. Thus cotton cloth treated with an aqueous solution of sodium methyl siliconate and monomeric methylated trimethylol melamine in presence of triethanolamine hydrochloride as catalyst and urea as odour preventive, dried at 225°F. and baked at 350°F. has good water-repellency, spot resistance, good handle, excellent dimensional stability on laundering and excellent recovery from creasing.

C.O.C.

Durable Mechanical Effects on Cellulose Fabrics by Applying Acetals

Quaker Chemical Products Corp.

USP 2,785,947

The fabric is treated with a non-volatile acetal of a mono- or di-aldehyde of $< 9^\circ\text{C}$ in presence of an acid catalyst and then dried, calendered, and baked. At no time during processing is there any smell caused by an aldehyde. This yields a fabric with a durable calendered finish and which does not retain chlorine on being bleached. Thus diethylene glycol (1 mole), paraformaldehyde (1), H_2SO_4 (0.001) and toluene (25 ml.) were refluxed and water removed by azeotropic distillation until 1 mole of water was removed. The mixture was then neutralised with dil. NaOH and the toluene removed by evaporation *in vacuo* at $\geq 110^\circ\text{C}$. The product is a viscous liquid which crystallises at $< 16^\circ\text{C}$. It is soluble in water, toluene and esters. Its molecule contains an average of 4 diethylene glycol units. Cotton sheeting was padded with 100% of its

weight of an aqueous solution containing 7.5% of the above product and 0.8 of NH_4Cl , dried to 11% moisture content at 180°F ., calendered at 400°F . and 5 tons per sq. in., baked for 5 min. at 300°F ., washed and dried. This gave a lustrous finish which resisted soaping at the boil, much improved ability to recover from creasing and no chlorine retention (AATCC Tentative Specification 1952: 69-52).

USP 2,785,948

Simple acetals of aliphatic and carbocyclic aldehydes of $< 9^\circ\text{C}$ and an aliphatic alcohol of $1-10^\circ\text{C}$ and $1-6\text{ OH}$ are used. Thus a spun viscose shirting was desized, boiled off, dried and then impregnated with its dry weight of an aqueous solution containing di(methoxy ethoxy ethyl) formal (b.p. 305°C .) (8.5%), Na_2SO_4 (0.6) and NaHSO_4 (2.4), dried at 180°F . on a pin tenter at its original dimensions and baked at 315°F . for 5 min. This yielded a fabric of good dimensional stability on repeated laundering.

USP 2,785,949

Polymeric acetal condensates obtained by treating an alkylene glycol with an aldehyde are used, e.g. the example quoted in the abstract of USP 2,785,747 (above) instead of the simple acetals used in USP 2,785,948 (above).

USP 2,785,996

Succinaldehyde, glutaraldehyde and other dialdehydes which are water soluble condense fairly readily under mildly acidic catalysis to yield durable ability to recover from creasing in fabrics treated with them. Thus viscose rayon gabardine was impregnated with its own weight of an aqueous solution containing 2-hydroxyadipaldehyde (4.5%), commercial pentaerythritol (4.5) and oxalic acid (1.0). It was dried under slight tension at 180°F . and baked for 5 min. at 315°F . On being subjected to the AATCC Tentative Test Method 1953:66-53 the sum of warp and weft angles was 250° for the treated fabric and 195° for the untreated.

C.O.C.

Dimensional Stabilisation of Regenerated Cellulosic Textiles by use of Aldoketene Dimers

American Viscose Corp.

USP 2,791,484

The goods are treated with an aldoketene of $10-20^\circ\text{C}$, and formula R-CH:CO . Thus spun viscose cloth was impregnated with an aqueous emulsion containing hexadecyl ketene dimer, an ethylene oxide ether of a sorbitan mono-oleate and, as catalyst, Na_2SO_4 and NaHSO_4 , dried and baked. The treated cloth had very good dimensional stability when given the Fed. Spec. CCC-T-191A Wash Test.

C.O.C.

Rotproofing of Leather and Cellulosic Textiles

A. T. White

USP 2,786,010

The material is impregnated with 0.1-10.0% by weight of tetrachlorohydroquinone from solution in a glycol ether, e.g. propylene glycol monomethyl ether. The rotproof imparted is resistant to washing.

C.O.C.

Flame-resistant and Rotproof Finish for Cellulosic Materials

DuP

USP 2,785,041

The material is impregnated with an aqueous acid solution of a polyvalent metal whose oxide and hydroxide are insoluble in water and then exposed to ammonia gas. Thus cotton cloth was impregnated with an aqueous acidic solution containing TiO_2 , Sb_2O_3 and HCl , the solution being made as described in USP 2,570,566 (J.S.D.C., 68, 229 (June 1952)) and then treated with ammonia gas.

C.O.C.

Delustring of Acetate Rayon

BR

BP 793,697

The delustring action of hot soap solution on acetate rayon is increased by adding to the bath $< 0.75\text{ c.c.}$ of 130 vol. H_2O_2 per litre. Thus bright acetate rayon is fully delustrated by boiling for 90 min. in a bath containing per litre 5 g. of soap and 1 c.c. of 130 vol. H_2O_2 .

C.O.C.

Multi-coloured Durable Tipped Effects on Embossed Fabrics

Joseph Bancroft & Sons Co.

USP 2,785,081

The fabric is impregnated with a resinous precondensate, dried and embossed at $225-350^\circ\text{F}$. with a pattern of different depths. The embossed fabric is then treated, e.g. in a Dornbusch No. 5 tipping machine, so that a pigmented resinous precondensate is applied to the tips of the face of the fabric. On the first run very light pressure is applied so that colour is applied on to the topmost layer of tips. On the next run, using the same or a different

colour on the tipping roller, pressure is increased so that the colour is applied to the two topmost layers of tips. Further runs to enable lower layers of tips to be coloured may be made if desired. Finally the fabric is baked to set the applied colour paste.

C.O.C.

Aluminium Phosphate for imparting Soil-resistance to Textiles

Mohasco Industries

USP 2,786,787

The surface of the goods is treated with an aqueous dispersion of AlPO_4 of very fine particle size. Thus AlPO_4 (1 part) of particle size $> 70\text{ m}\mu$ was stirred in salt-free water for 10 min. Pile fabric (22 oz. per sq. yd. of pile) was immersed face down in the dispersion so as to pick up 1% solids on its dry weight.

C.O.C.

Coating Fabric, Pigments etc., with Pyrolysed p-Xylene or Substituted p-Xylene

DuP

USP 2,785,090

p-Xylene is heated under reduced pressure at about 975°C . The pyrolysed gas is passed into a coating chamber maintained at room temperature. The material to be coated is kept in this chamber until a thick enough coating is formed, polymerisation of the p-xylene occurring directly on the material to produce a smooth even coating. Cellulose acetate fabric coated in this manner with poly-p-xylene is useful as a filter cloth, powdered TiO_2 treated in this manner with polypseudocumene is used as a delustring agent for textiles.

C.O.C.

Pile Fabrics simulating Natural Furs

Lister & Co.

BP 793,699

Fabric is made with a pile formed of two yarns of the same length but one of them made from fibres which can be made to shrink without matting while the other is unaffected by the treatment. On subjecting the fabric to a treatment which causes one of the pile yarns to shrink a product is obtained with a pile made up of yarns of different heights.

C.O.C.

Annual Review—Textiles 1957 (VI p. 562)

Effects of Dyeing on the Permanent Set of Wool. II—Effects of Acid Mordant Dyes (VIII p. 563)

Dyeing and Finishing Frieze and Pile Fabrics containing Man-made Fibres (VIII p. 564)

Improving the Bonding Power between Polyethylene Terephthalate and Adhesives (XIII p. 568)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Decrystallisation of Cotton Cellulose

C. H. Haydel, J. F. Seal, H. J. Janssen, and H. L. E. Vix

Ind. Eng. Chem., 50, 74-75 (Jan. 1958)

The removal of monoethylamine reagent from decrystallised cotton was investigated on the pilot plant scale, (a) by extraction with hexane and (b) by evaporation in a current of nitrogen. With (a) about 20 extractions were required to remove the amine, and both cellulose I and III lattices were present in the residual crystalline regions. The amine was removed much more easily by (b), leaving products of low crystallinity. The remaining crystalline regions consisted of essentially pure cellulose III after very slow evaporation, and cellulose I after rapid evaporation; intermediate rates of evaporation produced mixed lattices.

W.K.R.

Chain-length Breakdown of Cellulose by Acetic-acid Solutions of Water and Sulphuric Acid

C. J. Malm, K. T. Barkey, E. B. Lefferts, and R. T. Gielow

Ind. Eng. Chem., 50, 103-106 (Jan. 1958)

Specific conductivity measurements show that, at low concentrations, the ionisation of sulphuric acid in acetic acid is low. Freezing point data indicate that sulphuric acid forms hydrates in aqueous acetic acid. The addition of cellulose to a ternary mixture affects the equilibrium, as sulphuric acid is sorbed. The breakdown of the cellulose chain depends on the quantity and uniformity of the sorbed sulphuric acid. With uniformly reactive cellulose, the addition of water to the system protects the cellulose from degradation. With cellulose which is not uniformly reactive, the addition of water increases the uniformity of sulphuric acid sorption and thus the rate of breakdown. At higher water concentrations, uniformity of diffusion reaches a maximum, the rate of breakdown is low and similar to that observed with uniformly reactive cellulose.

W.K.R.

Replacing Hydroxyl Groups in Cotton Cellulose

E. Klein and J. E. Snowden

Ind. Eng. Chem., **50**, 80-82 (Jan. 1958)

The reaction between cotton cellulose and methanesulphonyl chloride and *p*-toluenesulphonyl chloride was studied to find the best methods of preparing cellulose sulphonates. New cellulose derivatives in which the hydroxyl group was replaced, were made from these esters. Reagents used in the exchange reactions included phthalimide, *p*-toluenesulphonamide, amines, phenols, halogens, potassium thiocyanate, substituted phosphoric acids and nitropropane. The effectiveness of the reactions was studied by examination of the infrared spectra of the products. The removal of sulphonate groups which have esterified secondary hydroxyl groups and the effect of adjacent acetyl groups are discussed.

W.K.R.

Oxidising Partially Etherified Cottons

R. M. Reinhardt, J. O. Reid, and T. W. Fenner

Ind. Eng. Chem., **50**, 83-86 (Jan. 1958)

Partially etherified cottons were oxidised by chromic acid to form textile materials which were soluble in dil. NaOH. Ethers prepared under swelling conditions and with hydrophilic substituents formed more soluble products after oxidation, thus permitting less drastic oxidation conditions and greater retention of useful textile properties. The rate of oxidation was greatly increased, without additional degradation, by adding oxalic acid to the chromic acid. Oxidised carboxymethylated cotton (D.S. = 0.1) cloth retained about 70% of its original strength and was 95% soluble in alkali.

W.K.R.

Infrared Spectra of Xanthate Compounds

L. H. Little and J. Leja

Proc. 2nd Internat. Congress Surface Activity, **3**, 261-266 (1957)**Influence of Water Concentration on the Hydrolysis of Unstabilised Cellulose Nitrate in Acetone-Water Solution**

P. E. Gagnon, K. F. Keirstead, B. T. Newbold, and J. Thomas

Canadian J. Chem., **36**, 695-699 (April 1958)**Reactions of the Xanthate Ion at the Air-Water Interface**

J. E. L. Bowcott

Proc. 2nd Internat. Congress Surface Activity, **3**, 267-272 (1957)**Periodate Oxidation of Methyl 4:6-O-Benzylidene- α -D-glucoside**

R. D. Guthrie and J. Hounoyman

Chem. and Ind., 388-389 (29 March 1958)

A ring structure is proposed for oxy(methyl 4:6-O-benzylidene- α -D-glucoside). This crystallises unchanged from water but a different compound is obtained from nitromethane which can be converted to the original by treatment with water. Another compound is obtained by boiling either of these with methanol and this is also converted to the original on treatment with water. Complex equilibria are to be expected in aqueous and alcoholic solutions of products of periodate oxidation.

W.R.M.

Affinity of Nitrogen Dioxide Oxycelluloses and Periodate Oxycelluloses for Methanol

T. P. Nevell

Chem. and Ind., 389-390 (29 March 1958)

Oxycelluloses prepared by oxidation of cellulose with nitrogen dioxide or periodate have affinity for methanol and about 25% of the oxidised chain units react with methanol. It is suggested that other oxidised units form a cyclic semiacetal involving the primary alcohol group and one or other of the aldehyde groups.

W.R.M.

PATENTS**Cast Calendering Supercalendered Coated Paper**

S. D. Warren Co.

USP 2,780,563

The paper web is coated with an aqueous suspension comprising pigments and hydrophilic swellable adhesives, e.g. a water-soluble caseinate. The coated paper is dried and immediately moistened with water or an aqueous liquid and pressed against a wet, heated, highly polished finishing surface to evaporate the water. The coated surface should come into contact with the wet finishing surface within 5-6 seconds after having been moistened.

The aqueous liquid may be water with or without additives, e.g. ammonia, surface active agents, metal wetting agents, and/or formaldehyde. Suitable apparatus comprises a cylindrical drum having a highly polished, chrome-plated metal face, and a press roll having a yielding surface, e.g. rubber.

R.A.

Moisture Resistant Coated Paper Webs

Gardner Board & Carton Co.

USP 2,756,164

The invention relates generally to that mode of producing coated paper and board wherein the surface of the felted web is first plasticised and then a coating substance is applied by imprinting. USP 2,419,207; 2,515,340 (s.s.p.c., 67, 46 (Jan. 1951)), and 2,370,344 are referred to. The coating mixture contains as its chief ingredients finely divided clay, cooked starch, synthetic resin for insolubilising the starch, and water. The plasticising solution contains an acid catalyst and a heat removable alkaline substance to raise its pH above 7. The resin is so chosen that it is catalysed by the acid catalyst when the alkaline substance is removed by heat. As a result, corrosion of the steel calender rolls is reduced or eliminated.

R.A.

Alkaline Paper Resistant to Attack by Microorganisms

Dow Chemical Co.

BP 794,406

A pentachlorophenol compound and a molar excess (with respect to the foregoing) of a long chain aliphatic amine compound having at least one H attached to the amino N incorporated into pulp which is formed into paper at pH 7.2-9.8 yields a paper which resists attack by microorganisms.

C.O.C.

Transfers having No Tendency to Curl

Dennison Manufacturing Co.

BP 793,391

A curl-resistant sizing layer of non-hygroscopic particles is interposed between and adhesively joined to the backing, and the transfer layer. China clay is the preferred material but a number of substances are suitable including silicates and barytes. The binder of the sizing coating should not swell substantially in the time required for the release of the transfer, and for best results it should be highly insoluble. Suitable binders include starch, casein, various polymers and proteins.

R.A.

Improving the Resistance of Wallpaper to Water, Staining and Washing

Société des Usines Chimiques Rhône-Poulenc

BP 792,390

Resistance to water and staining is imparted to wallpaper by treating it with 1-3% aq. aluminium trifluoride and, after drying, with an aq. emulsion of a polysiloxane in presence of a suitable emulsifying agent, e.g. a stearate or oleate of an organic base. The aluminium trifluoride solution and the polysiloxane emulsion are applied to the decorative surface only, preferably by means of a roller or spray gun. The amount of polysiloxane deposited on the paper should be of the order of 0.5 g. per sq.m. The colours and fastness of the printed portions of the wallpaper are not affected.

R.A.

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS**Type of Some Hydrogen Bonds of Collagen**

N. G. Esipova

Biofizika, **2**, 461-464 (1957);*Chem. Abs.*, **52**, 3892 (10 March 1958)

The temperature of denaturation, judged by the sudden changes of viscosity of solutions of various collagens, varied in accordance with the hydroxyproline content. These temperatures are independent of the strength of the solutions. These results agree with work previously reported by Gustavson and show that the bonds between the OH of hydroxyproline and the carbonyl O are inside the collagen molecule.

C.O.C.

Application of Acrylic Coatings to Leather

Y. Y. Margulio

Vsesoyuz. Nauch. Inzh.-Tekh. Obshchestvo Legkoj Prom., Materialy Soveshchanij po Krasheniyo i Odelke Kozh dlya Verkhia Obuvi, 45-46 (1953);*Referat. Zhur., Khim., Abstr. No. 57209 (1955);**Chem. Abs.*, **52**, 5865 (10 April 1958)

A discussion of the effect of additions of "alizarin oil", sulphonated fish oil, blood, blood and egg albumin,

casein, wax, pigments, and resin on the adhesion strength and the quality of the film are discussed; also those on the adhesion of preliminary defatting, surface washing, priming with "Emulsion A", and of the moisture content of the leather before dyeing. The acrylic coatings considered were deemed to be too thick and too thermoplastic and not permeable enough to air and water vapour. C.O.C.

Rotproofing of Leather and Cellulosic Textiles (X p. 566)

XIII—RUBBER; RESINS; PLASTICS

Hetero-chain Polyamides. V—Kinetics of the Formation of Mixed Polyamides from Hexamethylenediammonium Azela-ate and ϵ -Caprolactam

V. M. Kharitonov, T. M. Frunze, and V. V. Korshak
Izvestiya Akad. Nauk S.S.S.R., otel. khim. nauk, 115-118 (Jan. 1958)

It is shown that in the polycondensation of mixed polyamides the composition of the formed polymer does not depend upon the kinetics of the separate stages of the process but is determined by the ratio of the initial components. It is suggested that the rate of polycondensation of the ϵ -caprolactam is much less than that of hexamethylenediammonium azela-ate. G.J.K.

High-molecular-weight Polymers of Ethylene Oxide Polymerisation with Alkaline Earth Carbonate Catalysts

F. N. Hill, F. E. Bailey, and J. T. Fitzpatrick
Ind. Eng. Chem., 50, 5-7 (Jan. 1958)

Water-soluble polymers of ethylene oxide with intrinsic viscosities of up to 10 were readily prepared with aid of alkaline earth (particularly Sr) carbonates as catalysts. To be effective, the carbonate must contain some adsorbed water and must be free from certain anions, particularly nitrate.

Solution Properties

F. E. Bailey, G. M. Powell, and K. L. Smith

Ibid., 8-11

High molecular weight polymers of ethylene oxide are thermoplastic resins which are miscible with water in all proportions and are soluble in certain organic solvents, e.g. chloroform. Dilute aqueous solutions show considerable molecular interaction and the viscosities are very dependent on the rate of shear. Resins with intrinsic viscosity of about 10 have very great thickening power in aqueous solution. The upper solution temperature depends on both mol.wt. and concentration. The polymers can be salted out of solution by adding simple electrolytes.

Plastic Properties

K. L. Smith and R. Van Cleve

Ibid., 12-16

The polymers have very high molecular weights, are largely linear and possess an unusually high degree of crystallinity. Polymers in the range intrinsic viscosity 2-10, have stiffness of the order 50,000 lb. per sq.in. at room temp., extension at break 700%, brittle temp. -50°C. Properties of the resins above the m.p. (66°C.) are similar to those in aqueous solution. Moisture sorption is very low, and physical properties are practically unaffected by R.H. up to 90%. W.K.R.

PATENTS

Pigmented Coatings for Rubber Mats

Dow Chemical Co. *USP* 2,786,785

A polymer latex made up of the following polymers or copolymers (A) 20-70% styrene and 80-30% butadiene; (B) Vinyl chloride and 0-30% of a monoethylenically unsaturated monomer, and (C) 18-48% acrylonitrile and 82-52% butadiene, together with pigment, vulcanisation accelerator and thickener when applied to rubber mats yields a coating which is highly resistant to abrasion and does not soften the rubber. In addition it enables very bright colours to be applied. C.O.C.

Pigmented Vinylidene Plastics

B. F. Goodrich Co. *USP* 2,786,822

Vinylidene resin plaster colour master batches of extremely high quality are efficiently and cheaply prepared by milling the plastic and pigment with water and a liquid water-miscible organic solvent for the plastic. The amount of solvent used is not sufficient to cause agglomeration of or

dissolve a substantial amount of the plastic. Thus water (700 g.), dioxane (700 g.), polystyrene (200 g.), and Indo Red RV 20 (HAR) (methylenaminoanthraquinone) (200) were milled for 45 hr. with No. 00 French flint pebbles (7 lb.). The product and rinse water were collected and filtered. The filter cake was washed, dried and ground to yield 398 g. of a fine bright red powder. C.O.C.

Surface Treatment of Thermoplastic Film

BrC *BP* 793,185

The film while softened by heat is pressed by means of direct fluid pressure against a suitable impressing surface (e.g. a polishing surface or one finely embossed) and cooled while in contact with the surface to a temperature at which it retains the texture imparted to it. C.O.C.

Improving the Bonding Power between Polyethylene Terephthalate and Adhesives

Bjorksten Research Laboratories *USP* 2,785,085

Treating Mylar with vinyl trichlorosilane and rinsing with water much increases its affinity for adhesives, particularly epoxy resins. C.O.C.

Polyvinyl Acetate Emulsions Stabilised with Hydroxyethyl Cellulose (III p. 557)

XIV—ANALYSIS; TESTING; APPARATUS

Determining the Fat Content of Textiles

K. Heidler and M. Horálek

Věsta a Výzkum v Průmyslu textil., 1, 35-48 (1956):

Chem. Abs., 52, 5831 (10 April 1958)

Wool is extended with hot anhydrous propyl or isopropyl alcohol and the extract titrated with water to a definite turbidity. This turbidity depends on the particle size of the separated fat and therefore on the rate of addition of the water. Use of K oleate as an emulsifier did not remove this difficulty; a controlled rate of addition must be used. Extracting for > 5-10 min., the temperature of the solution during titration and the moisture content of the sample did not affect the results. Soaps are not included in the determination. The recommended procedure is to weigh a 3 g. sample of wool to 0.1 g., stir with 100 ml. anhydrous isopropyl alcohol, press with a stirring rod, and reflux for 10 min. Cool for 2 min., remove the wool and filter the extract. Pipette 10 ml. of the filtrate into a cylindrical cuvette 20 cm. high and 30 mm. diameter, and add water, 2 drops/sec., until the turbidity obscures lines 0.25 mm. thick drawn with Indian ink on paper placed under the cuvette. The time needed for the determination is 15-20 min. and the accuracy 0.3%. The method is applicable to all types of fibres. C.O.C.

Study of Viscose Rayon in 1- μ . Cross-sections

W. G. Settele

Textil-Rund., 13, 153-159 (March 1958)

Methods for obtaining such cross-sections by means of special embedding media, e.g. Plexiglas, and an ultramicrotome are discussed. The advantage of the section is increased perception of fibre characteristics such as pore size and pigmentation measurement of the circumference yielded values different to those obtained on normal cross-sections. A method of determining dye absorption using 3-4 mg. of fibre is described. S.R.C.

Slurry Titrations of Unstabilised Cellulose Nitrate

P. E. Gagnon, K. F. Keirstead, and B. T. Newbould
Canadian J. Chem., 36, 672-677 (April 1958)

PATENT

Colouring Dormant Grass

H. A. Gardner and R. Watson

USP 2,786,821

Dormant grasses, e.g. Bermuda grass, are coloured green *in situ*, e.g. on golf courses during autumn and winter, with an aqueous dispersion containing (a) a water insoluble green pigment, (b) a water-soluble dye and (c) a water-dispersible colourless binder. Thus 3 oz. of a dry mixture of C.I. Acid Green 1 (120), Light Chrome Green (an inorganic pigment based on lead chromate and Prussian Blue) (20), Ca hydrate (30) and casein powder (24) when dissolved in 6 gal. of water suffices to colour 100 sq.ft. of dormant Bermuda grass green with good resistance to weathering. C.O.C.

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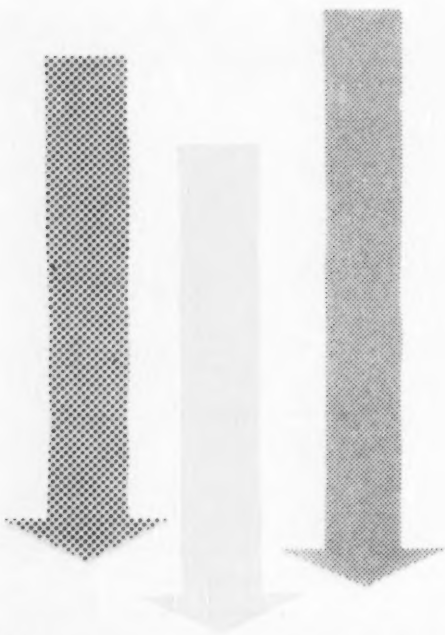
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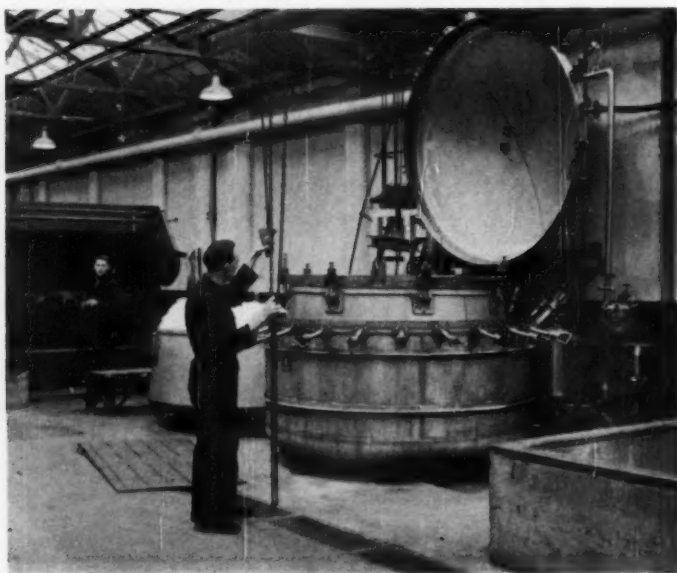
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FORTHCOMING MEETINGS OF THE SOCIETY — continued from page viii

Friday, 6th March 1959

MIDLANDS SECTION. Section Annual Dinner. George Hotel, Nottingham.

Thursday, 12th March 1959

MIDLANDS SECTION. *Dyeing and the Future*. J. Boulton, Esq., M.Sc.Tech., F.R.I.C., F.T.I., F.S.D.C., President of the Society. (Joint meeting with the Coventry Textile Society.) Courtauld's Acetate and Synthetic Fibres Laboratory, Lockhurst Lane, Coventry. 7 p.m.

Wednesday, 18th March 1959

MIDLANDS SECTION. *Photoelectric Colorimeters... their uses and limitations in the Dyehouse*. J. V. Alderson, Esq., B.Sc., A.R.C.S. (Joint meeting with the British Association of Chemists.) Midland Hotel, Derby. 7 p.m.

Friday, 20th March 1959

MANCHESTER SECTION. *Symposium on Re-active Dyes*. College of Science and Technology, Manchester. Further details later.

Thursday, 2nd April 1959

MIDLANDS SECTION. *Colour Physics and Match Prediction*. (Lecturer to be announced later.) (Joint meeting with the Textile Institute.) Carpet Trades Ltd. Canteen, Kidderminster. 7 p.m.

Wednesday, 15th April 1959

MIDLANDS SECTION. Annual General Meeting of the Section followed by a showing of New Scientific Films. King's Head Hotel, Loughborough. 7 p.m.

Friday, 17th April 1959

MANCHESTER SECTION. Annual General Meeting. *Stenter Drying*. A. T. Uthwatt, Esq. (Mather & Platt Ltd., Research Dept.). The Textile Institute, Manchester. 7 p.m.

Friday, 24th April 1959

LONDON SECTION. Annual General Meeting and Dinner. Waldorf Hotel, London, W.C.2. 6 p.m.

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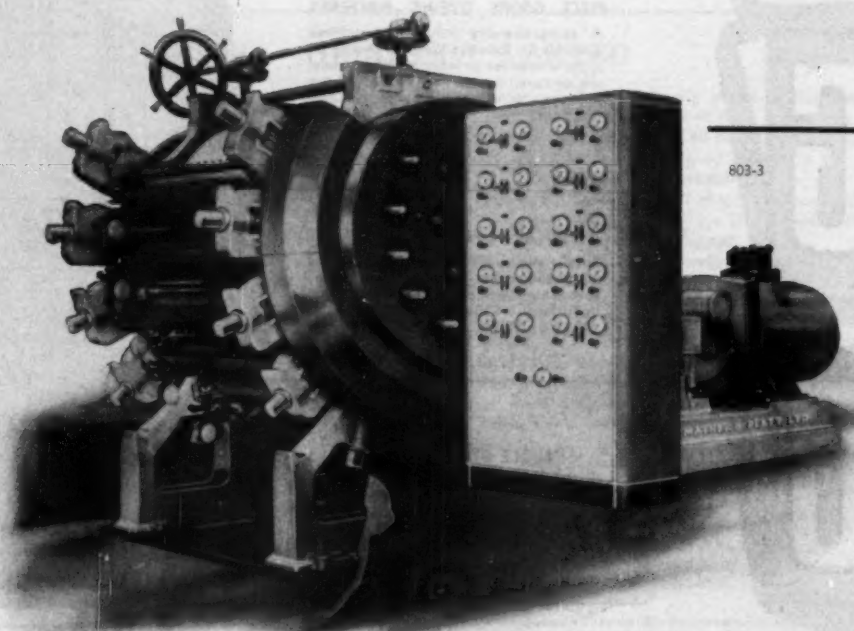
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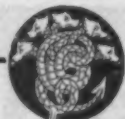
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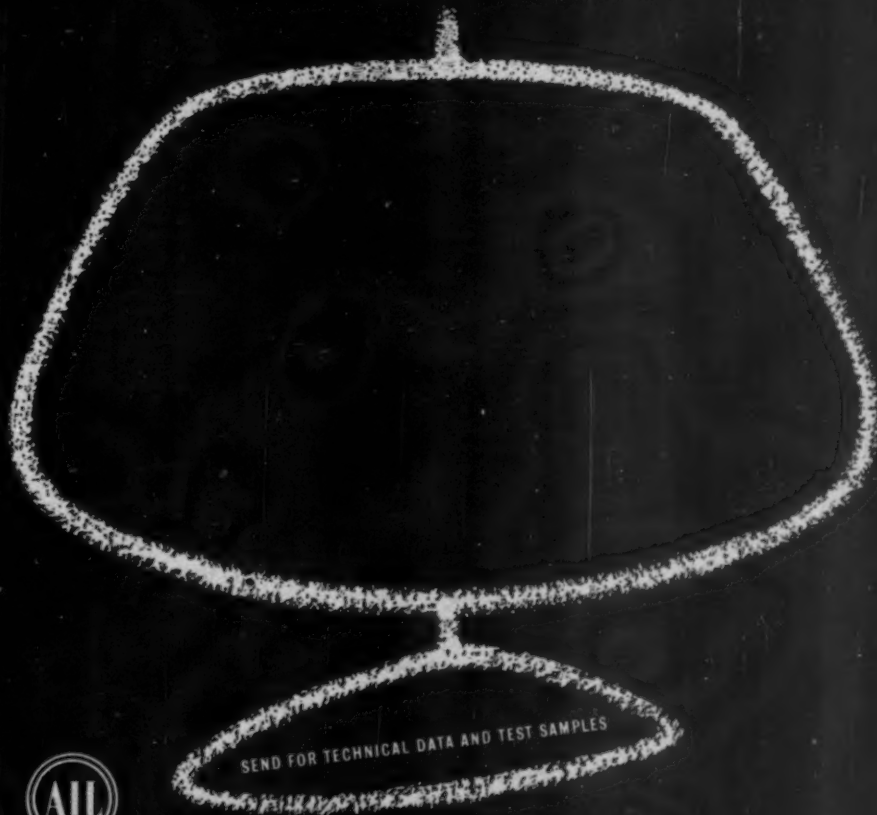
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